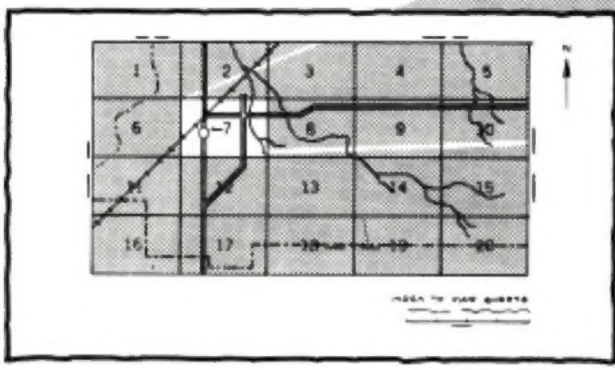
Soil Survey of

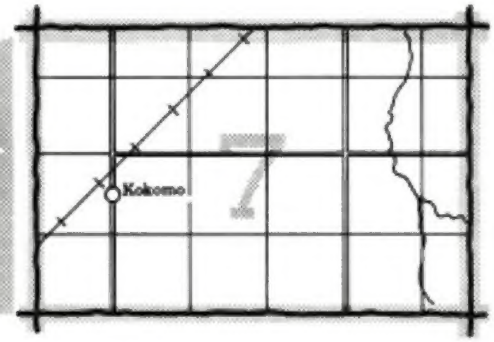
Clinton County, Iowa

United States Department of Agriculture
Soil Conservation Service
in cooperation with
The Iowa Agriculture and Home Economics Experiment Station and
The Cooperative Extension Service
Iowa State University and
The Department of Soil Conservation, State of Iowa

HOW TO USE

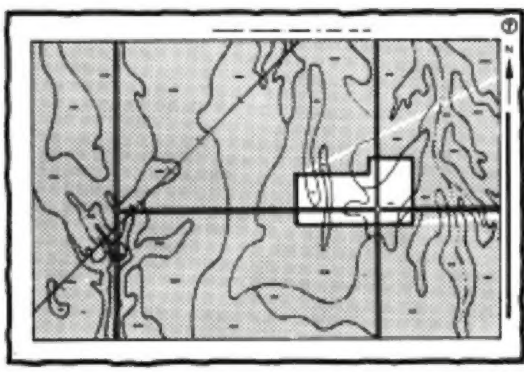
1. Locate your area of interest on the "Index to Map Sheets"

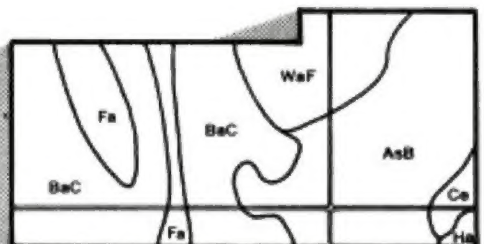




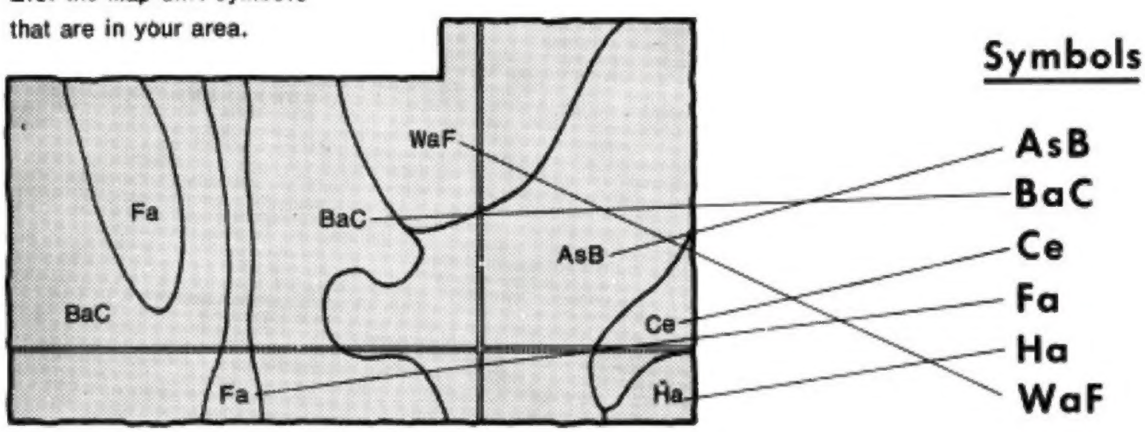
2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.



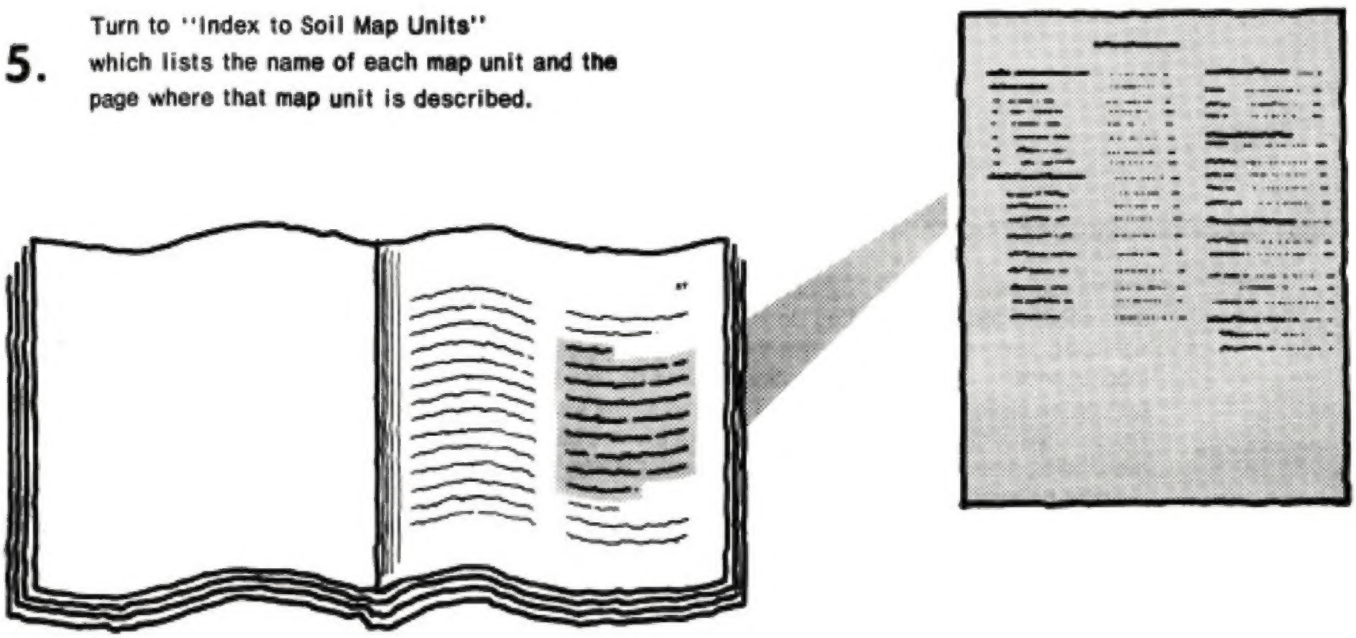


4. List the map unit symbols that are in your area.

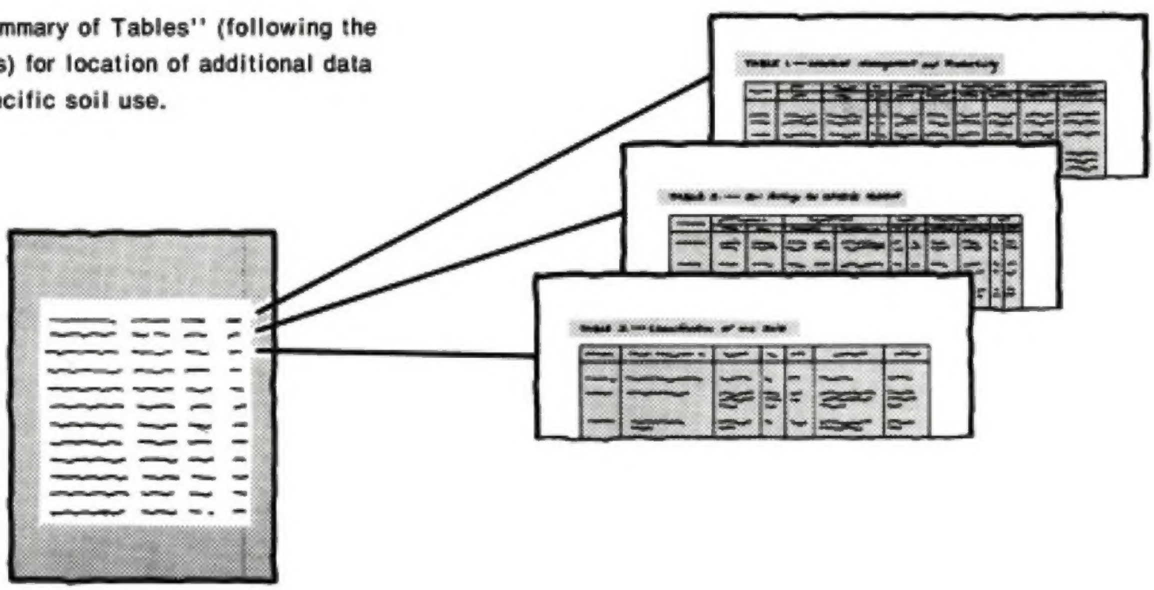


THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

This survey was made cooperatively by the Soil Conservation Service and the Iowa Agriculture and Home Economics Experiment Station; the Cooperative Extension Service, Iowa State University; and the Department of Soil Conservation, State of Iowa. It is part of the technical assistance furnished to the Clinton County Soil Conservation District. Funds appropriated by Clinton County were used to defray part of the cost of this survey. Major fieldwork was performed in the period 1970-1976. Soil names and descriptions were approved in 1978. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1976.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Cover: Corn, on Tama soils south of Low Moor, Iowa, is the main crop in Clinton County.

contents

soil series

Issued March 1981

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summary of tables

preface

This soil survey contains information that can be used in land-planning programs in Clinton County, Iowa. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations inherent in the soil or hazards that adversely affect the soil, improvements needed to overcome the limitations or reduce the hazards, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

soil survey of Clinton County, Iowa

By Louis E. Boeckman and Larry R. Sabata, Soil Conservation Service

Fieldwork by Louis E. Boeckman, Larry K. Johnson, Larry R. Sabata, Wayne D. Fredrick, Ralph Mendenhall, Patrick C. Merchant, and Robert E. Thomas, Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service in cooperation with the Iowa Agriculture and Home Economics Experiment Station; the Cooperative Extension Service, Iowa State University; and the Department of Soil Conservation, State of Iowa

Clinton County is in the east-central part of Iowa (fig. 1). Clinton is the county seat and the largest city. The county has an area of 444,800 acres. It is bounded on the north by Jackson County, on the west by Jones and Cedar counties, on the south by Scott County, and on the east by the Mississippi River.

general nature of the survey area

Farming is the main economic enterprise in Clinton County, but industry and urbanization are increasing rapidly in the vicinity of Clinton, Camanche, and De Witt. The principal crops are corn, soybeans, oats, hay, and pasture. Except for soybeans, most of the crops are fed to livestock. Beef cattle, hogs, and dairying are the principal sources of income, but this is affected by the market. If the market is down for principal farm products, then cash grain crops are substituted.

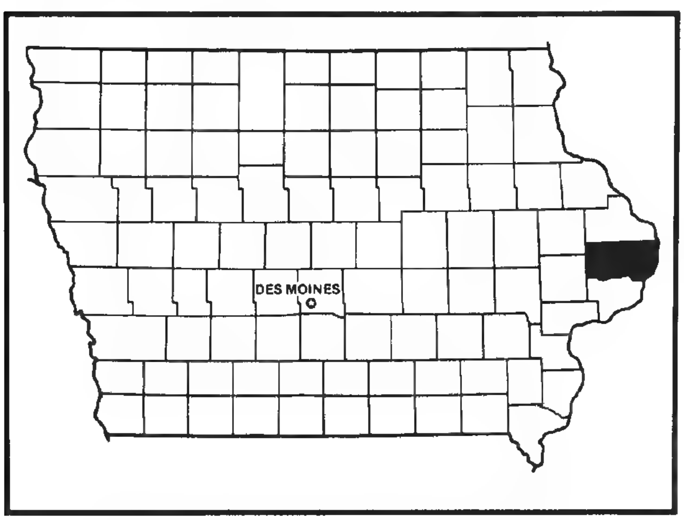

Figure 1.—Location of Clinton County in Iowa.

climate

Prepared by the National Climatic Center, Asheville, North Carolina.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Clinton, Iowa, in the period 1951 to 1974. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 24 degrees F, and the average daily minimum temperature is 16 degrees. The lowest temperature on record, which occurred at Clinton on December 21, 1963, is -27 degrees. In summer the average temperature is 72 degrees, and the average daily maximum temperature is 83 degrees. The highest recorded temperature, which occurred at Clinton on July 27, 1955, is 100 degrees.

Growing degree days are shown in table 2. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop

between the last freeze in spring and the first freeze in fall.

The total annual precipitation is 36 inches. Of this, 24 inches, or 65 percent, usually falls in April through September, which includes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 20 inches. The heaviest 1-day rainfall during the period of record was 6.5 inches at Clinton on September 13, 1961. Thunderstorms occur on about 47 days each year, and most occur in summer.

Average seasonal snowfall is 32 inches. The greatest snow depth at any one time during the period of record was 16 inches. On an average of 22 days, at least 1 inch of snow is on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 68 percent of the time possible in summer and 44 percent in winter. The prevailing wind is from the west-northwest. Average windspeed is highest, 12 miles per hour, in April.

physiography, relief, and drainage

Clinton County is located in the east-central part of Iowa and is on the west bank of the Mississippi River. It is on the nose of the far eastern bulge of the Mississippi River.

Clinton County can be divided into several major areas of distinct physiography and topography. These physiographic areas are the Kansan-Nebraskan glacial till plain, the "Iowan Erosion Surface," and three regions of bottom land. The three bottom-land regions are along the Mississippi River, along the Wapsipinicon River, and along the "Goose Lake Channel."

The largest physiographic area is the deep, loess-covered Kansan and Nebraskan glacial till plain. The till plain is covered mostly by 10 to 30 feet of loess. It is 700 to 900 feet above sea level (*16*). The glacial till plain is generally in the northern half of the county, although it extends into the extreme southwest corner of the county. It gently slopes toward the south and southeast from the northwest part of the county. This till plain has been subject to a large amount of erosion since its formation. It is made up primarily of rolling to steep slopes and nearly level to undulating ridges. Drainageways dissect the area. Along the Mississippi River, in Elk River and Spring Valley townships, the slopes are steep and have high relief. These slopes are more gentle away from the major streams. The smoothest part of this upland till plain is a belt that extends from the town of Delmar for several miles southeasterly to the town of Petersville, and from there south to the town of Welton. Near Elvira the topography is also very gently rolling.

The second largest physiographic area, known as the "Iowan Erosion Surface," generally lies in the southern half of the county. This area ranges from 620 to 780 feet above sea level. Some soils of the "Iowan Erosion Surface" formed in glacial drift and glacial till and have surficial material about 1 to 2 feet thick over the glacial material. Other soils formed from loess-covered glacial till or sand and gravel. The topography is generally undulating, except for more sloping paha ridges located north of De Witt and west of Wheatland. These pahas (*11*) are distinct, elongated, loess-capped ridges that are elevated above the "Iowan Erosion Surface" and are oriented in a northwestern to southeastern direction. Dune-shaped hills of sandy material are along bottom lands of the Wapsipinicon River and in the western part of the county. Near Wheatland and Bliedorn the surface is somewhat higher and is more eroded.

Near Low Moor and extending toward De Witt are well-sorted sandy materials covered by 40 to 60 inches of loess. Little is understood about the origin of this loess-covered sand. The underlying sandy material originated prior to loess deposition, some 14,000 to 29,000 years ago (*11*). Further research is needed to know exactly what processes formed these underlying sediments.

The third major physiographic area is the bottom land along rivers and creeks. The bottom land along the Missisippi River, the first major bottom-land region, generally is 1 to 3 miles wide, except in the northeast corner of the county where the uplands extend to the river. At one time, bottom land did exist in the area from the city of Clinton to the Elk River. This pre-existing bottom land was flooded by the construction of a dam in the 1930's. In several places, usually near the tributaries of the Mississippi River, the bottom land is separated by well-defined terraces that formed in lacustrine sediments (*9*). These terraces are generally 620 to 630 feet above sea level. Other high terraces, located primarily near the city of Camanche, formed in fine and medium sandy alluvium. These terraces are somewhat lower in elevation than those formed in lacustrine sediments. In many places, however, the bottom land grades directly from the uplands.

The second major bottom-land region is along the Wapsipinicon River and is mostly from 1/4 mile to 3 miles in width. In many areas along the river, the water table is directly influenced by the water level of the river. This bottom land ranges from 10 to 20 feet above the average flow of the river.

The third major bottom-land region is commonly referred to as the "Goose Lake Channel." It extends primarily along Deep Creek to the vicinity of Goose Lake, where it extends south along Brophy Creek and joins the Wapsipinicon River. The Bluffs that separate this bottom land from the adjoining upland and terrace levels are well marked north of Goose Lake but are less distinct south along Brophy Creek.

This bottom land formed as a result of diverted glacial drainage. It is believed that during the late Wisconsin Glaciation, glacial ice blocked the Mississippi River where the present city of Clinton is located (*15*). The

water backed up, overflowed into the Maquoketa River, and eventually found a temporary new channel that joined the Wapsipinicon River further to the south. This outlet formed the present "Goose Lake Channel" bottoms. When the glacial ice retreated, the Mississippi River eventually resumed its original channel course.

Very little of the drainage of Clinton County flows directly into the Mississippi River. In fact only a strip of land about 9 miles wide along the Mississippi River drains directly into the river. Prairie, Sugar, and Deep Creeks in the northern part of the county drain northward into the Maquoketa River. The major part of the county drains in a southern and southeastern direction and empties into the Wapsipinicon River. Yankee Run, Rock, Barber, Silver, Ames, Cherry, and Brophy Creeks are the main drainage channels. Because of the natural lay of the land, an extensive system of drainage ditches, south and southeast of the town of Lost Nation and near the town of Calamus, helps drain the west-central part of the county. Streams that flow through the loess uplands cut deep channels, and the current is rapid. When these streams reach the broad valleys of the gently undulating "Iowan Erosion Surface," the water flows at a much slower rate, filling existing stream channels and drainage ditches.

history and development

The area that would become Clinton County was acquired by the United States as part of the Louisiana Purchase in 1803. In 1832 the Clinton County area was again purchased by the United States; this time from the Indians who claimed eastern Iowa as their tribal home.

In 1836 the area of Clinton County became part of the territory of Wisconsin (*8*). It was called Dubuque County. In 1838 this area became part of the territory of Iowa. At this time it was subdivided, and part of it became the present Clinton County.

In 1836 Strong (Elijah) Buell, Clinton County's first settler, built a log cabin on the west bank of the Mississippi River in the area now called Lyons. During this period, the Sac and Fox Indians camped at Elk River and along Deep Creek.

In 1840 the county seat was established at Camanche in Clinton County. Elijah Buell, George Griswold, and Robert Bourne were elected the first commissioners of Clinton County. The county seat was then transferred to the geographic center of the county, Vandenburg. The name of Vandenburg was changed to De Witt in 1842.

In 1869 the county seat was moved to Clinton where it has remained ever since. The population in Clinton County has increased steadily from a few settlers in 1835 to 56,749 in 1970.

how this survey was made

Soil scientists made this survey to learn what soils are in the survey area, where they are, and how they can be used. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; and the kinds of rock. They dug many holes to study soil profiles. A profile is the sequence of natural layers, or horizons, in a soil. It extends from the surface down into the parent material, which has been changed very little by leaching or by plant roots.

The soil scientists recorded the characteristics of the profiles they studied and compared those profiles with others in nearby counties and in more distant places. They classified and named the soils according to nationwide uniform procedures. They drew the boundaries of the soils on aerial photographs. These photographs show trees, buildings, fields, roads, and other details that help in drawing boundaries accurately. The soil maps at the back of this publication were prepared from aerial photographs.

The areas shown on a soil map are called map units. Most map units are made up of one kind of soil. Some are made up of two or more kinds. The map units in this survey area are described under "General soil map units" and "Detailed soil map units."

While a soil survey is in progress, samples of some soils are taken for laboratory measurements and for engineering tests. All soils are field tested to determine their characteristics. Interpretations of those characteristics may be modified during the survey. Data are assembled from other sources, such as test results, records, field experience, and state and local specialists. For example, data on crop yields under defined management are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it can be used by farmers, woodland managers, engineers, planners, developers and builders, home buyers, and others.

general soil map units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each soil association on the general soil map is a unique natural landscape. Typically, a soil association consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one association can occur in other units but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one association differ from place to place in slope, depth, drainage, and other characteristics that affect management.

soil descriptions

Areas dominated by nearly level to very steep, well drained soils

This group of soils makes up about 52 percent of the county and includes the Fayette, Downs-Fayette, and Tama associations. These soils formed in loess on ridges and side slopes of uplands.

The nearly level to gently sloping soils in this group are well suited to cultivated crops. The steep and very steep soils are poorly suited to cultivated crops and are better suited to pasture or trees.

The principal management concerns are controlling erosion, improving fertility, and maintaining tilth. The less sloping soils are well suited to terracing, farming on the contour, and stripcropping. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility, increase the infiltration of water, and improve soil tilth.

1. Fayette association

Gently sloping to very steep, well drained soils that formed in loess; on uplands

This association consists of gently sloping to strongly sloping soils on ridgetops and strongly sloping to very steep soils on side slopes. Sides of valleys are dissected by many drainageways. Areas of this association are scattered throughout the northern half of the county. Also, a small area is concentrated in the extreme southwest corner of the county.

This association makes up about 28 percent of the county. It is about 68 percent Fayette soils and 32 percent soils of minor extent (fig. 2).

The well drained Fayette soils are gently sloping to strongly sloping on rounded ridgetops and strongly sloping to very steep on side slopes. Fayette soils generally have a surface layer of very dark grayish brown and dark grayish brown silt loam about 7 inches thick, a subsoil of yellowish brown silt loam and silty clay loam, and a substratum of yellowish brown silt loam mottled with light brownish gray.

The minor soils in this association are the Lindley, Chaseburg, and Nordness soils. The Rock Outcrop-Nordness complex also occurs to a minor extent. The Lindley soils formed in glacial till that is exposed on the lower parts of some of the side slopes. Chaseburg soils formed in silty alluvium within the many drainageways that dissect the uplands. Nordness soils formed in a very thin layer of loess over limestone bedrock. They are on some side slopes near drainageways. The Rock Outcrop-Nordness complex is on steep or very steep side slopes adjacent to the stream valleys.

In recent years more acreage in this association has been cultivated to crops. Because of steep slopes and low organic matter content of the soils, the principal management concerns are soil erosion, fertility, and tilth. Most of the steeper soils should be kept in pasture or hay. The less sloping soils are suited to row crops grown in rotation with oats and hay. Farming on the contour, terracing, or stripcropping helps to reduce soil loss.

2. Downs-Fayette association

Gently sloping to moderately steep, well drained soils that formed in loess; on uplands

Areas of these soils are scattered primarily throughout the northeastern half of the county. These areas are characterized by gently sloping to moderately sloping, narrow ridgetops and strongly sloping to moderately steep side slopes. The side slopes are dissected by many small drainageways.

This association makes up about 14 percent of the county. It is about 47 percent Downs soils, 25 percent Fayette soils, and 28 percent soils of minor extent.

The gently sloping to strongly sloping Downs soils are well drained. They are on ridgetops and side slopes.

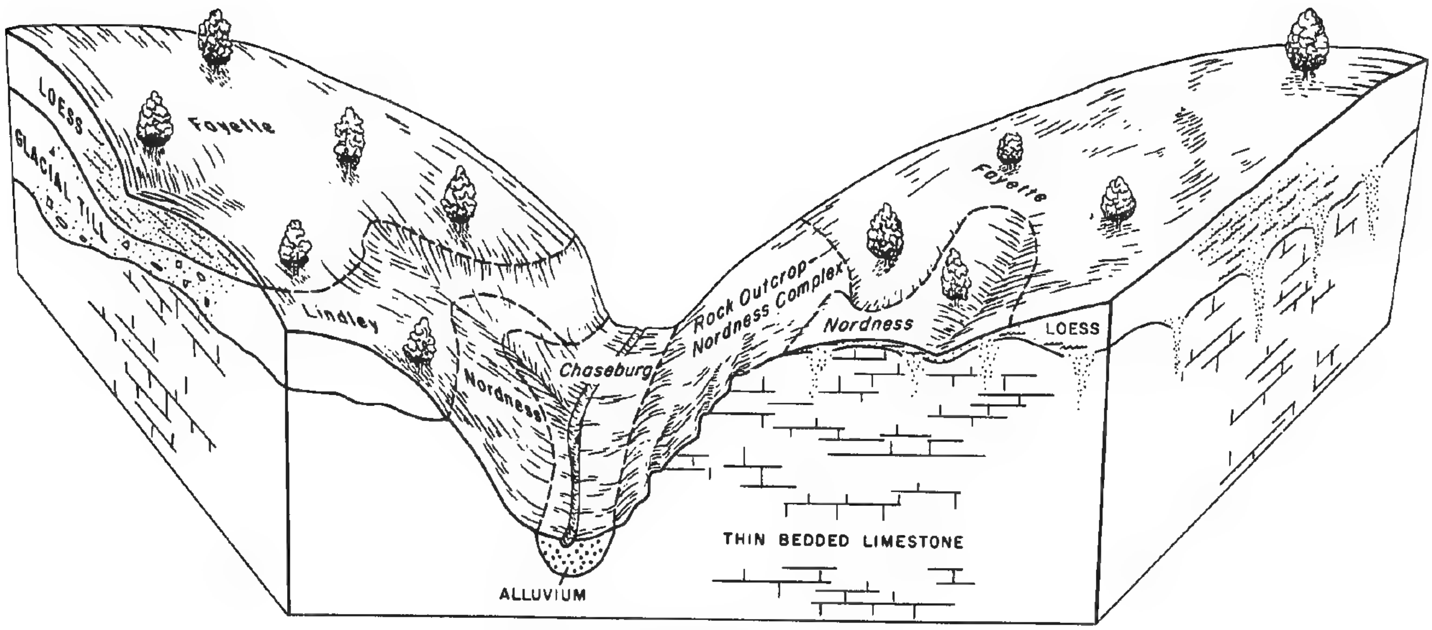

Figure 2.—The Fayette association.

They generally have a surface layer of very dark grayish brown and dark brown silt loam about 7 inches thick; a subsoil of brown, dark yellowish brown, and yellowish brown silty clay loam; and a substratum of yellowish brown silt loam with grayish brown mottles.

The moderately steep Fayette soils are well drained. They are on ridgetops and side slopes. They generally have a surface layer of very dark grayish brown and dark grayish brown silt loam about 7 inches thick, a subsoil of yellowish brown silt loam and silty clay loam, and a substratum of yellowish brown silt loam mottled with light brownish gray.

Included among the minor soils in this association are the Atterberry, Gara, and Chaseburg soils. The somewhat poorly drained Atterberry soils are very gently sloping. They are at the heads of drainageways and in swales on uplands. Gara soils formed in glacial till. They are on lower side slopes. Chaseburg soils formed in silty alluvium within the drainageways that dissect the uplands.

A considerable acreage is being cultivated to row crops. The remainder is used for pasture or hay. The principal management concerns are soil erosion, fertility, and tilth. Most of the soils are suited to row crops grown in rotation with oats and hay. Farming on the contour, terracing, or stripcropping helps to reduce soil loss. Subsurface drains might be needed in some of the drainageways to permit more timely field operations.

3. Tama association

Nearly level to strongly sloping, well drained soils that formed in loess; on uplands

Areas of these soils are scattered primarily throughout the northern half of the county. These areas are characterized by nearly level to moderately sloping ridgetops and moderately and strongly sloping side slopes.

This association makes up about 10 percent of the county. It is about 61 percent Tama soils and 39 percent soils of minor extent (fig. 3).

The Tama soils are well drained. They are nearly level to moderately sloping on ridgetops and gently sloping to strongly sloping on side slopes. They generally have a surface layer of very dark brown or very dark grayish brown silt loam about 16 inches thick; a subsoil of brown, friable silty clay loam; and a substratum of dark yellowish brown silty clay loam.

Among the minor soils in this association are the Downs, Muscatine, Garwin, and Atterberry soils in the uplands. Also of minor extent are the Colo and Ely soils in narrow drainageways that dissect the uplands. The Downs soils have a thinner surface layer that is lower in organic matter than that of the Tama soils. The Muscatine soils are somewhat poorly drained and the Garwin soils are poorly drained. The Atterberry soils are somewhat poorly drained and have a light-colored subsurface layer. The Colo soils are poorly drained and formed in silty alluvial material. The Ely soils are somewhat poorly drained and formed in silty alluvial and colluvial material.

The soils in this association are used primarily for row crops. The principal management concerns are soil erosion, fertility, and tilth. Subsurface drains permit more

timely operations on the somewhat poorly drained and poorly drained soils. Most nearly level to gently sloping soils are suitable for growing row crops year after year. On the more sloping soils, a rotation of row crops with oats and hay reduces soil erosion. Contouring, terracing, or stripcropping also reduces soil erosion on more sloping soils.

Areas dominated by nearly level to moderately sloping, well drained, somewhat poorly drained, and poorly drained soils

This group of soils makes up about 22 percent of the county. It includes the Dinsdale-Klinger-Maxfield, Atterberry-Tama, and Walford-Atterberry associations. These soils formed in loess and the underlying glacial till or sandy material. They are on uplands and stream terraces.

The soils in this group are used primarily for cultivated crops. Most nearly level and gently sloping soils are suitable for growing row crops year after year.

Subsurface drains permit more timely field operations on the somewhat poorly drained and poorly drained soils. Other management concerns are controlling soil erosion, maintaining tilth, and improving fertility. Contouring, terracing, stripcropping, and rotation of row crops with oats and hay reduce erosion. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps to improve fertility and to maintain soil tilth.

4. Dinsdale-Klinger-Maxfield association

Nearly level to moderately sloping, well drained, somewhat poorly drained, and poorly drained soils that formed in loess and glacial till; on uplands

Areas of these soils are scattered primarily throughout the southern half of the county. These areas are on uplands. The soils formed in 24 to 40 inches of loess over glacial till.

This association makes up about 9 percent of the county. It is about 22 percent Dinsdale soils, 18 percent Klinger soils, 11 percent Maxfield soils, and 49 percent soils of minor extent (fig. 4).

The gently and moderately sloping, well drained Dinsdale soils are on ridges and side slopes. The Dinsdale soils are above or below the less sloping Klinger and Maxfield soils. The somewhat poorly drained, very gently sloping Klinger soils are on concave side slopes and toe slopes. They are between Dinsdale and Maxfield soils. The nearly level, poorly drained Maxfield soils are at the heads of broad drainageways. They are below Dinsdale and Klinger soils. Maxfield and Klinger soils have a seasonally high water table.

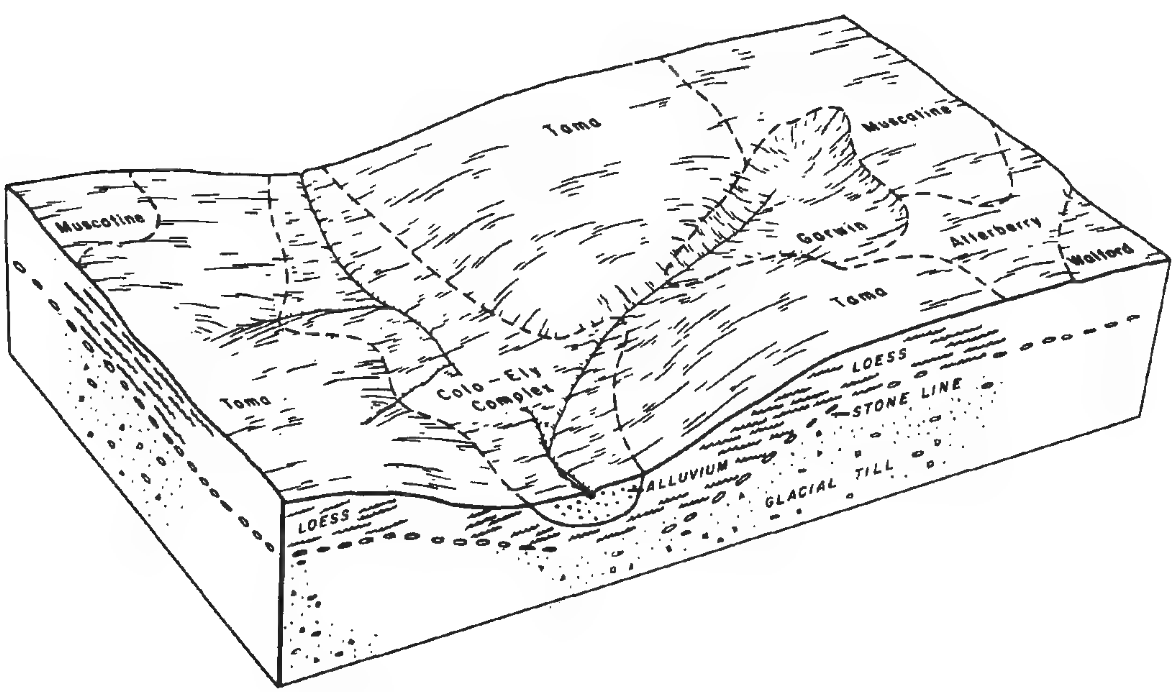

Figure 3.—The Tama association.

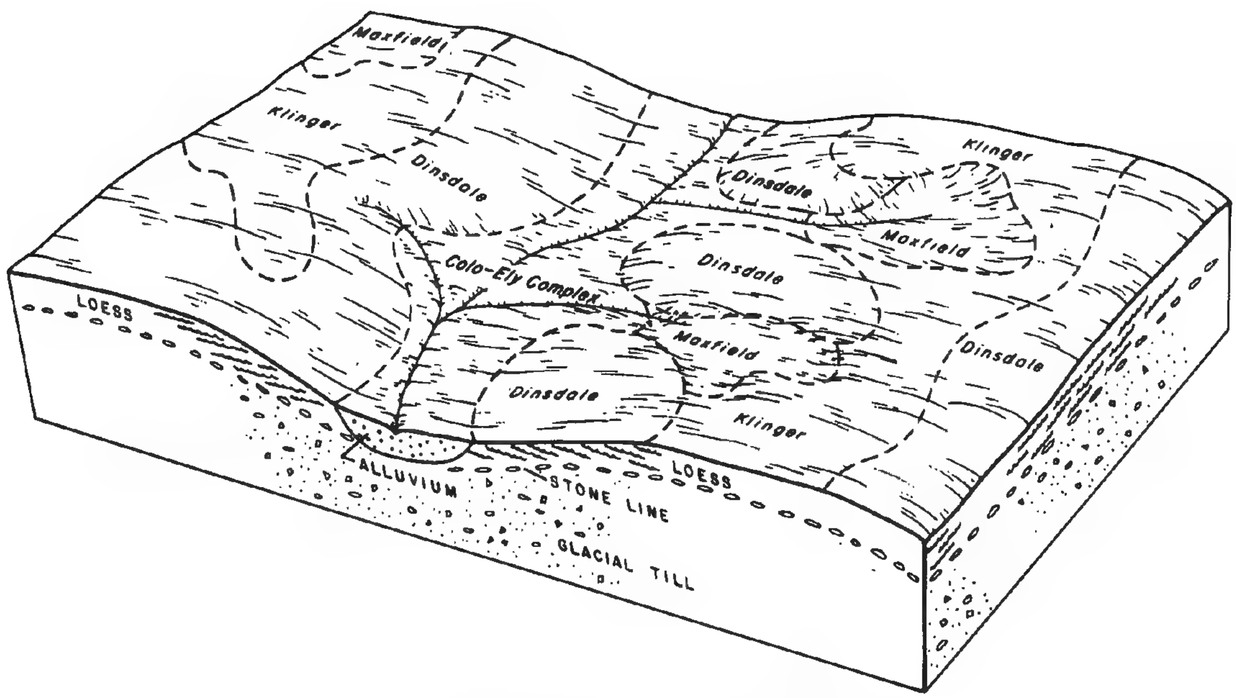

Figure 4.—The Dinsdale-Klinger-Maxfield association.

Dinsdale soils generally have a black surface layer of silt loam about 7 inches thick; a subsurface layer of very dark brown and very dark grayish silty clay loam about 11 inches thick; a subsoil of brown and dark yellowish brown silty clay loam; and a substratum of brown sandy clay loam and loam.

Klinger soils generally have a surface layer of black silt loam about 8 inches thick; a subsurface layer of very dark brown light silty clay loam about 9 inches thick; a subsoil of dark grayish brown and yellowish brown silty clay loam and loam; and a substratum of yellowish brown loam.

Maxfield soils generally have surface and subsurface layers of black silty clay loam, which combined, are 19 inches thick; a subsoil of dark gray, grayish brown, and yellowish brown silty clay loam; and a substratum of yellowish brown loam.

Among the minor soils in this association are Ansgar, Colo, Dickinson, Ely, Kenyon, and Sawmill soils. The Ansgar soils are similar to the Klinger soils but have a light-colored subsurface layer. Ely soils are somewhat poorly drained alluvial and colluvial soils on foot slopes. Kenyon soils are moderately well drained and have a loamy surface layer over a loam subsoil in glacial till. Dickinson soils are somewhat excessively drained and formed in eolian sandy material. They are shaped like dunes and are at a higher position on the landscape. Colo and Sawmill soils are poorly drained, silty, alluvial soils that are in the drainageways of uplands.

The soils in this association are used primarily for row crops. The principal management concerns are soil erosion, fertility, and tilth. Subsurface drains permit more timely field operations on the somewhat poorly drained and poorly drained soils. Most nearly level and gently sloping soils are suitable for growing row crops year after year. On the more sloping soils, a rotation of row crops with oats and hay reduces soil erosion. Contouring, terracing, or stripcropping also reduces soil erosion on the more sloping soils.

5. Atterberry-Tama association

Nearly level to gently sloping, somewhat poorly drained and well drained soils that formed in loess and underlying sandy material; on uplands and stream terraces

Areas of these soils are scattered throughout the southern half of the county. These areas are on uplands and loess-covered benches. The soils formed in 40 to 60 inches of loess over sandy material.

This association makes up about 12 percent of the county. It is about 32 percent Atterberry soils, sandy substratum, and similar soils; 28 percent Tama soils, sandy substratum, and similar soils; and 40 percent soils of minor extent (fig. 5).

Atterberry soils, sandy substratum, are nearly level and somewhat poorly drained. They are on benches along streams and near heads of drainageways in uplands.

They generally have a surface layer of very dark gray silt loam about 8 inches thick and a subsurface layer of very dark grayish brown and dark grayish brown silt loam about 8 inches thick. The upper part of the subsoil is grayish brown and yellowish brown silt loam mottled with dark brown. The lower part is strong brown and reddish brown sandy loam. The substratum is strong brown loamy sand.

Tama soils, sandy substratum, are nearly level to gently sloping and well drained. They are on ridges and side slopes of stream benches and uplands. They generally have a surface layer of very dark brown or very dark grayish brown silt loam about 22 inches thick. The subsoil is brown and dark yellowish brown silt loam in the upper part and is yellowish brown sandy loam in the lower part. The substratum is yellowish brown fine and medium sand.

Among the similar, minor soils are the Muscatine soils, sandy substratum; Garwin soils, sandy substratum; and Waukegan soils. Other minor soils in this association are scattered areas of Thorp, Saude, Dinsdale, Rockton, and Ripon soils.

The well drained Waukegan soils are 24 to 40 inches of loess over sandy material. The poorly drained Garwin soils, sandy substratum, and the somewhat poorly drained Muscatine soils, sandy substratum, are 40 to 60 inches of loess over sandy material. The Thorp soils are 40 to 50 inches of loess over sandy material. They have a light-colored subsurface layer and are poorly drained. The well drained Saude soils are 24 to 32 inches of loamy material over sand and gravel. The well drained Dinsdale soils are 24 to 40 inches of loess over glacial till. The well drained Rockton soils are 20 to 40 inches of loamy material over limestone bedrock. The well drained Ripon soils are 20 to 40 inches of loess over limestone bedrock.

The soils in this association are used primarily for row crops. Most nearly level and gently sloping soils are suitable for continuous row crop production. The principal management concerns are soil erosion, fertility, and tilth. Subsurface drains permit more timely field operations on the somewhat poorly drained and poorly drained soils. Installation and operation of subsurface drainage systems can be difficult because of the underlying, loose sandy material.

6. Walford-Atterberry association

Nearly level and very gently sloping, poorly drained and somewhat poorly drained soils that formed in loess; on stream terraces and uplands

This association consists of a unique landscape of high, loess-covered benches that are as much as 1 mile wide. One area, located north of Goose Lake, adjoins the flood plain of Deep Creek. A smaller area is located northeast of the town of Elvira and adjoins the flood plain of Brophy Creek.

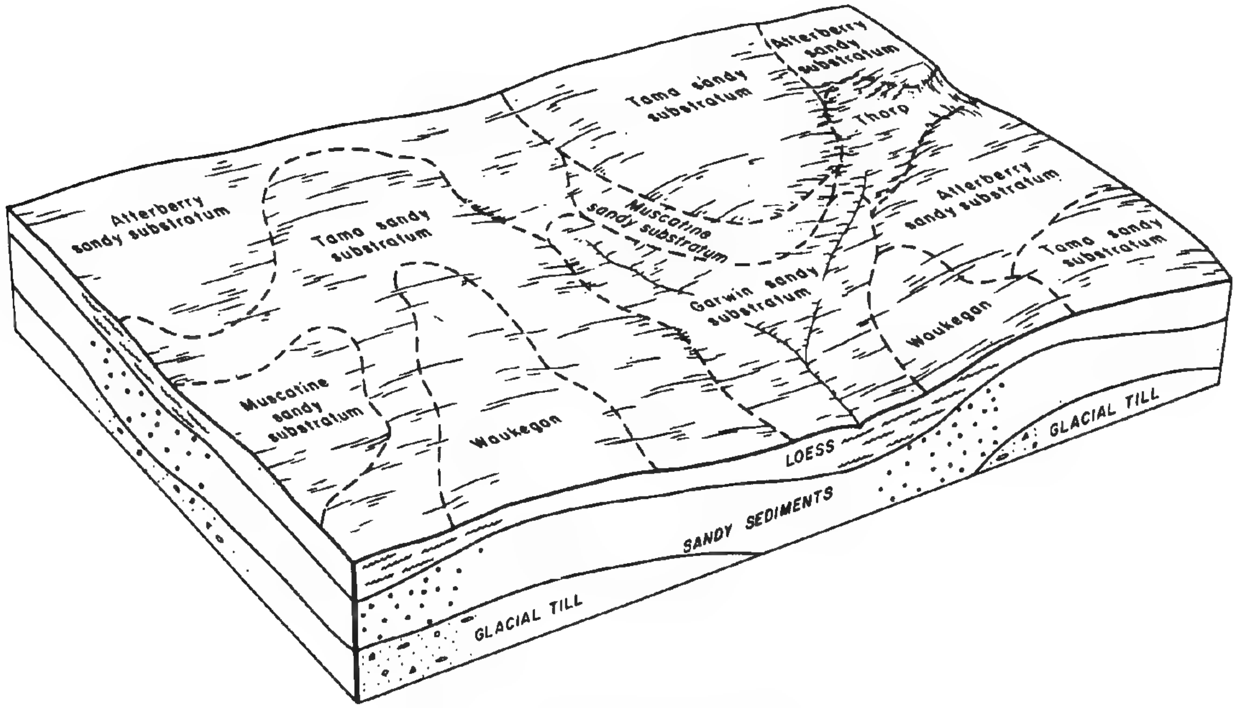

Figure 5.—The Atterberry-Tama association.

This association makes up less than 1 percent of the county. It is about 44 percent Walford soils, 24 percent Atterberry soils, and 32 percent soils of minor extent.

The nearly level Walford soils are in slightly depressional areas. These poorly drained soils have s surface layer of very dark gray silt loam about 9 inches thick, a subsurface layer of grayish brown silt loam 10 inches thick, a subsoil of grayish brown silty clay loam mottled with olive brown and yellowish brown, and a substratum of light olive gray silt loam with yellowish brown mottles.

The very gently sloping Atterberry soils are on broad, convex side slopes. These somewhat poorly drained soils have a surface layer of black and very dark gray silt loam 8 inches thick, a subsurface layer of dark grayish brown silt loam 8 inches thick, a subsoil of brown and grayish brown silty clay loam mottled with yellowish brown and strong brown, and a substratum of grayish brown silt loam with yellowish brown mottles.

Among the minor soils in this association are Downs, Fayette, Muscatine, and Tama soils on the loess-covered benches and Chaseburg and Colo soils along the adjoining tributaries of Brophy Creek and Deep Creek. The Tama, Downs, and Fayette soils are silty and well drained. In this association these soils generally range from nearly level to moderately sloping. Muscatine soils are silty and somewhat poorly drained. Chaseburg soils are silty, well drained, alluvial, and stratified. Colo soils are silty, poorly drained, and alluvial.

These soils are used for hay, pasture, and row crops. The main management concerns are improving drainage and fertility.

Areas dominated by nearly level to moderately steep, excessively drained, somewhat excessively drained, and poorly drained soils

This group of soils makes up about 10 percent of the county. These soils formed in eolian sands, sandy alluvium, or lacustrine clay on uplands or on stream terraces.

The soils in this group are used primarily for hay and pasture. Some areas are in cultivated crops.

The principal management concerns are controlling wind and water erosion and improving drainage and fertility. Many soils in this group are droughty. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps to improve fertility, increase the infiltration of water, and reduce erosion. The sandy soils are not well suited to terracing, but contouring and stripcropping help reduce erosion. Subsurface drains are needed in the clayey soils; however, they do not function well.

7. Sparta-Dickinson association

Nearly level to moderately steep, excessively drained and somewhat excessively drained soils that formed in eolian sands; on uplands and on stream terraces

This association consists of a landscape of sloping soils shaped like dunes and intervening swales. Primarily, these areas are located immediately east of the flood plain of the Wapsipinicon River and in the western half of the county.

This association makes up about 7 percent of the county. It is about 40 percent Sparta soils, 31 percent Dickinson soils, and 29 percent soils of minor extent.

The Sparta soils are moderately sloping to moderately steep and excessively drained. They are on mound-shaped ridges and side slopes. They generally have surface and subsurface layers of very dark grayish brown loamy fine sand which, combined, are about 9 inches thick; a subsoil of dark yellowish brown loamy fine sand; and a substratum of yellowish brown fine sand and medium sand.

The Dickinson soils are nearly level to strongly sloping and somewhat excessively drained. They are on ridges and side slopes. They generally have a surface layer of very dark brown fine sandy loam about 7 inches thick; a subsurface layer of very dark brown and very dark grayish brown fine sandy loam about 12 inches thick; a subsoil of brown and yellowish brown sandy loam, loamy sand, and sand; and a substratum of yellowish brown sand and thin bands of brown sandy loam.

Among the minor soils in this association are Chelsea, Lamont, Brady, and Granby soils. The Chelsea soils are similar to Sparta soils, and Lamont soils are similar to Dickinson soils. Because the Chelsea and Lamont soils formed under forest instead of prairie vegetation, they are lower in content of organic matter. The Brady and Granby soils are nearly level to very gently sloping in swales. Granby soils are sandy and poorly drained. Brady soils are somewhat poorly drained, have a sandy loam surface layer, and have a light-colored subsurface layer.

The soils in this association are used for hay, pasture, and row crops. Also, a few areas are being planted with coniferous trees. The main management concerns are improving fertility and controlling wind and water erosion. Most of the soils in this association are droughty, and yields are largely dependent on the amount and timeliness of rainfall.

8. Finchford-Zwingle association

Nearly level to moderately sloping, excessively drained and poorly drained soils that formed in sandy alluvium and lacustrine clays; on stream terraces

This association consists of nearly level and gently sloping soils on terraces along streams and the moderately sloping and steep or very steep soils of escarpments. This association is along the Mississippi River and the lower reaches of Brophy Creek and Wapsipinicon River.

This association makes up about 3 percent of the county. It is about 19 percent Finchford soils, 6 percent Zwingle soils, and 75 percent soils of minor extent.

The Finchford soils are nearly level to moderately sloping and are excessively drained. These soils have surface and subsurface layers of very dark grayish brown loamy sand which, combined, are 18 inches thick; a subsoil of dark brown loamy sand; and a substratum of brown, medium gravelly sand.

The Zwingle soils are nearly level to gently sloping. These poorly drained soils have a surface layer of very dark gray silt loam about 3 inches thick; a subsurface layer of pale brown silt loam 7 inches thick; a subsoil of yellowish brown, dark brown, brown, and grayish brown silty clay loam and clay; and a substratum of brown silty clay and reddish brown strata.

Among the minor soils in this association are the Dickinson, Coyne, Waukee, Flagler, Tell, Udolpho, Wapsie, Medary, and Raddle soils and the Zwingle Variant. All are on terraces. The Dickinson soils are sandy loam over sand and are somewhat excessively drained. The well drained Coyne soils have loamy textures over stratified, silty-lacustrine material. The Waukee and Wapsie soils have loamy textures over sand and gravel. They are well drained. The Flagler soils are sandy loam over sand and gravel. They are somewhat excessively drained. The well drained Tell soils have silty textures over sand and gravel. The somewhat poorly drained Hayfield soils have loamy textures over sand and gravel. The poorly drained Niota soils are clay or silty clay throughout. Raddle soils are generally silty throughout and are well drained.

The soils in this association have quite varied uses. The more productive, silty or loamy soils are used for cultivated row crops or hay. The less productive, clayey soils are used primarily for pasture. The sandy soils are used for hay and pasture; however, a small acreage is planted to coniferous trees. The principal management concerns are controlling wind and water erosion and improving fertility and drainage. Many areas of this association are droughty, and yields are largely dependent on amount and timeliness of rainfall.

Areas dominated by nearly level, moderately well drained and poorly drained soils that are subject to flooding

This group of soils makes up about 16 percent of the county. These soils formed in silty or loamy alluvium on flood plains.

The soils of this group are used for row crops, hay, and pasture or are left idle. Nearly all the soils are subject to frequent flooding. Many of the soils also have a seasonal high water table.

The principal manangement concerns are improving drainage, reducing flooding, and improving fertility. Subsurface drains function well in these soils if suitable outlets are available. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility.

9. Colo-Chaseburg-Sawmill association

Nearly level and gently sloping, poorly drained and moderately well drained soils that formed in silty alluvium; on flood plains

This association consists of nearly level and gently sloping, silty soils on flood plains. These areas are within major stream valleys that dissect the uplands in various parts of the county.

This association makes up about 8 percent of the county. It is about 40 percent Colo soils, 23 percent Chaseburg soils, 17 percent Sawmill soils, and 20 percent soils of minor extent.

Colo and Sawmill soils are poorly drained and on bottom lands that are adjacent to upland soils formed under prairie vegetation. The Chaseburg soils are moderately well drained and are on bottom lands that are adjacent to upland soils formed under forest vegetation.

The Colo soils have a surface layer of black silty clay loam about 10 inches thick; a subsurface layer of black silty clay loam 28 inches thick; and a substratum of very dark gray, dark gray, and olive gray silty clay loam mottled with dark grayish brown.

The Chaseburg soils have a surface layer of dark grayish brown silt loam about 7 inches thick and a subsurface layer of stratified silt loam that is dark grayish brown, brown, and grayish brown.

The Sawmill soils have surface and subsurface layers of black silty clay loam which, combined, are about 12 inches thick; a subsoil of black, very dark gray, olive gray, and dark gray silty clay loam; and a substratum of light olive gray loam and silt loam with strong brown and olive brown mottles.

Among the minor soils in this association are the Elvira, Zook, Calco, and Nevin soils. The Elvira soils have a texture of silty clay loam, are poorly drained, and have a high concentration of iron. The Zook soils are heavy silty clay loam and are poorly drained. They are often in shallow depressions further away from the stream channel. The Calco soils are silty clay loam, poorly drained, and calcareous. The Nevin soils are silty clay loam and somewhat poorly drained. They are located on low terraces along streams.

The soils in this association are used for row crops, hay, and pasture. Most soils are subject to flooding and have a seasonal high water table. Management concerns of many of the soils are improving fertility and drainage. Protection from flooding and installation of surface drains are beneficial in some areas.

10. Ambraw association

Nearly level, poorly drained soils that formed in loamy alluvium; on flood plains

This association consists of nearly level, loamy soils on flood plains. Primarily, these areas are located within the flood plain of the Wapsipinicon and Mississippi Rivers.

This association makes up about 8 percent of the county. It is about 26 percent Ambraw soils and 74 percent soils of minor extent (fig. 6).

The poorly drained Ambraw soils are in many low lying swales and old, filled-in oxbows. They generally have a surface layer of black silty clay loam about 8 inches thick and a subsurface layer of very dark gray loam about 14 inches thick. The subsoil is dark gray and gray loam and sandy loam mottled with brown. The substratum is gray and grayish brown loamy fine sand with olive brown mottles.

Among minor soils in this association are Shaffton and Palms soils and the Wapsie Variant. Minor soils on terraces that are not subject to flooding are the Saude, Waukee, and Marshan soils. Other soils of minor extent are Fluvents and Aquolls. The Shaffton soils have loamy textures over stratified material and are somewhat poorly drained. The very poorly drained Palms soils consist of organic material over mineral soil material. The Wapsie Variant and Saude soils have loamy textures over sand or gravel. They are well drained. The poorly drained Marshan soils have loamy textures over sand and gravel. Fluvents are a broader group of soils that formed in recently deposited alluvial material. Aquolls are a broader group of soils that formed in marsh.

The soils in this association are used for row crops, hay, and pasture or are left idle. Many areas immediately adjacent to the Wapsipinicon and Mississippi Rivers remain in native woodland or scrub vegetation. Most areas that are being used for row crops, hay, and pasture originally were woodland or in scrub vegetation. These areas have been recently cleared. Almost all areas of this association are subject to frequent flooding and have a seasonal high water table, which is influenced by the level of the water in the nearby river. Management concerns of most of the soils in this association are improving fertility and drainage.

Field operations are often delayed, in most areas, because of frequent flooding and the seasonal high water table. Where adequate protection from flooding is provided, more timely field operations are possible.

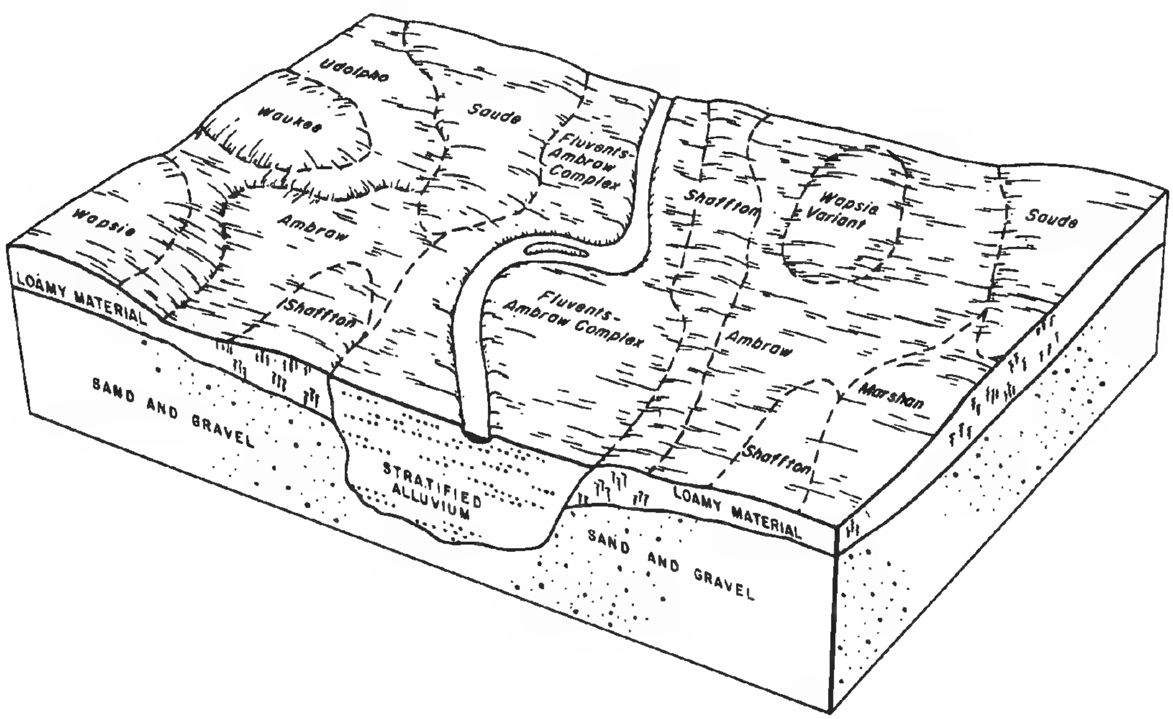

Figure 6.—The Ambraw association.

detailed soil map units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and management of the soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil, a brief description of the soil profile, and a listing of the principal hazards and limitations to be considered in planning management.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Fayette silt loam, 5 to 9 percent slopes, moderately eroded, is one of several phases in the Fayette series.

Some map units are made up of two or more major soils. These map units are called soil complexes.

A *soil complex* consists of two or more soils that occur as areas so intricately mixed or so small that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Colo-Ely complex, 2 to 5 percent slopes, is an example.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. These dissimiliar soils are described in each map unit. Also, some of the more unusual or strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes some *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Pits, quarries, is an example. Some miscellaneous areas are large enough to be delineated on the soil maps. Some that are too small to be delineated are identified by a special symbol on the soil maps.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

soil descriptions

11B—Colo-Ely complex, 2 to 5 percent slopes. These gently sloping, poorly drained and somewhat poorly drained soils are in drainageways of uplands. The Colo soils, which make up about 60 percent of this unit, are near to or within the stream channel or drainageway. They are subject to frequent flooding. The Ely soils, about 30 percent of the unit, are in a narrow band between the stream channel and the nearby hillsides of the uplands. Individual areas are long, narrow, and irregular in shape and are usually 10 to 30 acres in size.

Typically, the Colo soil has a surface layer of black, friable silty clay loam about 10 inches thick. The subsurface layer is about 28 inches thick. It is also black silty clay loam. To a depth of about 60 inches, the substratum is very dark gray, dark gray, and olive gray silty clay loam that is friable and is mottled with dark grayish brown.

Typically, the Ely soil has a surface layer of very dark brown silt loam about 9 inches thick. The subsurface layer is about 16 inches thick. It is black and very dark gray, friable silty clay loam. The subsoil is about 34 inches thick. The upper part is very dark grayish brown, friable silty clay loam. The middle part is olive brown, grayish brown, and light olive brown, mottled silty clay loam that is friable. The lower part is very dark grayish brown, mottled silty clay loam that is friable.

Included with these soils in mapping are some areas of soils which are immediately adjacent to the hillsides and which are well drained. These areas make up 5 to 10 percent of the unit.

The Colo soil has moderate permeability. Surface runoff is slow. The available water capacity is high. The tilth of this soil is good. This soil has a seasonal high

water table at a depth of 1 foot to 3 feet. The subsoil generally has a medium level of available phosphorus and is very low in available potassium. The surface layer is about 5 to 7 percent organic matter.

The Ely soil has moderate permeability. Surface runoff is medium. The available water capacity is very high. This soil has a seasonal high water table at a depth of 2 to 4 feet. The subsoil is generally very low in available phosphorus and potassium. The surface layer is 5 to 6 percent organic matter.

In most areas the soils in this complex are in cultivated crops and hay. They have fair potential for cultivated crops and trees and good potential for hay and pasture. They have poor potential for most engineering uses.

The soils in this complex are suited to corn, soybeans, and small grains and are well suited to grasses for hay and pasture. When used for cultivated crops, most individual areas of these soils are cropped along with surrounding soils because they are too small, narrow, and irregularly shaped to be cropped separately. The soils in this complex are generally wet because of overflow and seepage from more sloping soils. These soils have a tendency to puddle if worked when wet. Drainageways that carry a high concentration of water need to be maintained in grass to help prevent gullying. The proper installation of subsurface drains is usually needed in drainageways to remove excess water. Returning crop residue to the surface and the regular addition of other organic material into the plow layer improve fertility and maintain good tilth.

If these soils are used for pasture, grazing should be restricted during wet periods. Overgrazing or grazing when the soil is too wet causes surface compaction, increased runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is in capability subclass IIw.

41B—Sparta loamy fine sand, 2 to 5 percent slopes. This gently sloping, excessively drained soil is in uplands and on stream benches. It is on mound-shaped ridges and side slopes. Individual areas are oval or irregular in shape and are usually 5 to 20 acres in size.

Typically, the surface layer is very dark grayish brown, very friable loamy fine sand and is about 10 inches thick. The subsurface layer is about 9 inches thick. It is very dark grayish brown, very friable loamy fine sand. The subsoil is about 13 inches thick. It is dark yellowish brown, very friable loamy fine sand. The substratum is yellowish brown, loose fine and medium sand to a depth of 60 inches.

This soil has rapid permeability. Surface runoff is slow. The available water capacity is very low. Consistence is very friable to loose. The subsoil is generally very low in available phosphorus and potassium. The surface layer is about 1 to 1 1/2 percent organic matter.

Most areas of this soil are in cultivated crops, hay, and pasture. This soil has poor potential for cultivated crops but has fair potential for hay, pasture, and trees. It has fair potential for most engineering uses, but there is a pollution hazard when the soil is used for onsite sewage treatment.

This soil is poorly suited to corn, soybeans, and small grains. It is better suited to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, it is subject to wind and water erosion. This soil is very droughty, unless rainfall is above normal and timely. As this soil dries out, traction of farm machinery can be difficult because of the soil's very friable to loose consistence. If not protected by vegetation or crop residue, the blowing sand can damage newly seeded crops in the surrounding area. Conservation practices that leave crop residue on the surface help reduce soil erosion and conserve moisture. In addition, contour stripcropping helps reduce soil erosion. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve soil fertility.

The use of this soil for pasture or hay is an effective way of controlling erosion. Proper stocking rates; pasture rotation; and timely deferment of grazing, especially during dry periods help keep the pasture and soil in good condition.

This soil is moderately well suited to trees. Some areas are being used for windbreaks or commercial tree plantings. Tree seeds, cuttings, and seedlings survive and grow if precipitation is above normal and timely. Generally, supplemental water is needed to reduce seedling mortality. Competing vegetation should be controlled or removed by site preparation; by prescribed burning; or by spraying, cutting, or girdling.

This soil is in capability subclass IVs.

41C—Sparta loamy fine sand, 5 to 9 percent slopes. This moderately sloping, excessively drained soil is in uplands and on stream benches. It is on mound-shaped ridges and side slopes. Individual areas are irregular in shape and are usually 5 to 15 acres in size.

Typically, the surface layer is very dark grayish brown, very friable loamy fine sand and is about 7 inches thick. The subsurface layer is very dark grayish brown, very friable loamy fine sand about 9 inches thick. The subsoil is about 13 inches thick. It is dark yellowish brown, very friable loamy fine sand. The substratum is yellowish brown, loose fine and medium sand to a depth of 60 inches.

This soil has rapid permeability. Surface runoff is medium. The available water capacity is very low. Consistence is friable to loose. Generally, this soil is acid. The subsoil is very low in available phosphorus and potassium. The surface layer is about 1 percent organic matter.

Most areas of this soil are in cultivated crops, hay, and pasture. The soil has poor potential for cultivated crops but has fair potential for hay, pasture, and trees. It has fair potential for most engineering uses, but there is a

pollution hazard when the soil is used for onsite sewage treatment.

This soil is poorly suited to growing corn, soybeans, and small grains. It is better suited to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, it is subject to wind and water erosion. This soil is very droughty, unless rainfall is above normal and timely. As this soil dries out, traction of farm machinery can be difficult because of the soil's very friable to loose consistence. If not protected by vegetation or crop residue, the blowing sand can damage newly seeded crops in the surrounding area. Conservation practices that leave crop residue on the surface help reduce soil erosion and conserve moisture. In addition, contour stripcropping helps reduce soil erosion. Returning crop residue to the surface or the regular addition of other organic material into the plow layer also improves soil fertility and helps stabilize sand blowouts. Because of its acidity, this soil needs lime if it has not been applied in the past 3 to 5 years.

The use of this soil for pasture or hay is an effective way of controlling erosion. Proper stocking rates; pasture rotation; and timely deferment of grazing, especially during dry periods, help keep the pasture and soil in good condition.

This soil is moderately well suited to trees. Some areas are being used for windbreaks or commercial tree plantings. Tree seeds, cuttings, and seedlings survive and grow if precipitation is above normal and timely. Generally, supplemental water is needed to reduce seedling mortality. Competing vegetation should be controlled or removed by site preparation; by prescribed burning; or by spraying, cutting, or girdling.

This soil is in capability subclass IVs.

41E—Sparta loamy fine sand, 9 to 18 percent slopes. This strongly sloping and moderately steep, excessively drained soil is in uplands. It is on mound-shaped ridges and side slopes. Individual areas are irregular in shape and are usually 5 to 15 acres in size.

Typically, the surface layer is very dark grayish brown, very friable loamy fine sand and is about 9 inches thick. The subsoil is about 12 inches thick. It is dark yellowish brown, very friable loamy fine sand. The substratum is yellowish brown, loose fine and medium sand to a depth of about 60 inches. In some areas the surface layer is less than 7 inches thick.

This soil has rapid permeability. Surface runoff is medium. The available water capacity is very low. Consistence is very friable to loose. Generally, this soil is acid. The subsoil is very low in available phosphorus and potassium. The surface layer is about 1 percent organic matter.

Most areas of this soil are in hay and pasture. This soil has poor potential for cultivated crops, hay, and pasture but fair potential for trees. It has poor potential for most engineering uses. There is a pollution hazard when the soil is used for onsite sewage treatment.

This soil is not suited to cultivated crops. It is better suited to grasses and legumes for hay and pasture. It is subject to wind and water erosion and should be protected by a plant cover at all times. Cultivated crops should be grown only to reestablish seedings. This soil is very droughty unless rainfall is above normal and timely. As this soil dries out, traction of farm machines can become difficult because of the soil's very friable to loose consistence. Because of its acidity, this soil needs lime if it has not been applied in the past 3 to 5 years.

The use of this soil for pasture or hay is an effective way of controlling erosion. Proper stocking rates; pasture rotation; and timely deferment of grazing, especially during dry periods, help keep the pasture and soil in good condition.

This soil is moderately well suited to trees. Some areas are being used for windbreaks or commercial tree plantings. Tree seeds, cuttings, and seedlings survive and grow if precipitation is above normal and timely. Generally, supplemental water is needed to reduce seedling mortality. Competing vegetation should be controlled or removed by site preparation; by prescribed burning; or by spraying, cutting, or girdling.

This soil is in capability subclass VIIs.

42—Granby fine sandy loam, 0 to 2 percent slopes. This nearly level, poorly drained soil is on alluvial fans, in drainageways, and in depressions on benches along streams. This soil is subject to frequent flooding. Individual areas are irregular in shape and usually 5 to 15 acres in size.

Typically, the surface layer is black, very friable fine sandy loam abut 10 inches thick. The subsoil is about 16 inches thick. It is gray, very friable fine sand and a thin lens of dark gray, very friable sandy loam. To a depth of about 60 inches, the substratum is gray and dark gray, loose fine sand and loamy fine sand mottled with light olive brown.

This soil has rapid permeability. The surface runoff is very slow, and water ponds in depressional areas. The available water capacity is low. A seasonal high water table ranges in depth from the surface to 1 foot. Generally, this soil is neutral or slightly acid throughout the profile. The subsoil is generally very low in available phosphorus and potassium. The surface layer is about 2 1/2 to 3 1/2 percent organic matter.

Most areas of this soil are in cultivated crops, hay, and pasture. This soil has poor potential for cultivated crops and trees but fair potential for hay and pasture. It has poor potential for most engineering uses. There is a pollution hazard when the soil is used for onsite sewage treatment.

This soil is poorly suited to corn, soybeans, and small grains. It is better suited to grasses for hay and pasture. If this soil is used for cultivated crops, it is subject to wind erosion. Conservation practices that leave crop residue on the surface help reduce soil blowing. This soil has a seasonally high water table. Subsurface drains are

difficult to install and maintain because of the underlying, loose sand and the lack of adequate outlets. As the water table drops late in the growing season, this soil can become droughty if rainfall is below normal. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve soil fertility. The need for lime in the surface layer varies according to liming practices performed in previous years.

The use of this soil for pasture or hay is an effective way of controlling wind erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is poorly suited to trees, but a few areas of this soil are in timber. Tree seeds, cuttings, and seedlings have difficulty surviving and growing because of the seasonal high water table and frequent flooding. Subsurface drains and flood protection are needed. Competing vegetation should be controlled or removed by site preparation; by prescribed burning; or by spraying, cutting, or girdling.

This soil is in capability subclass IIIw.

51—Vesser silt loam, 0 to 2 percent slopes. This nearly level, poorly drained soil is on bottom lands, foot slopes, and alluvial fans. This soil is subject to occasional flooding. Individual areas are broad and irregular in shape and are 20 to 100 acres or more in size.

Typically, the surface soil is very dark gray, friable silt loam about 16 inches thick. The subsurface layer is grayish brown and dark grayish brown, friable silt loam with brown mottles. It is about 16 inches thick. The subsoil is about 28 inches thick. The upper part is dark gray, friable silty clay loam mottled with brown. The lower part is dark gray, firm silty clay loam with brown mottles. In some places these soils are silt loam throughout the profile.

Included with this soil in some mapping units are a few areas where 10 to 20 inches of overwash has covered the surface. These soils are low in organic matter. They are on foot slopes and fans. These included soils make up less than 5 percent of the unit.

This soil has moderate permeability. Surface runoff is slow. The available water capacity is high. A seasonal high water table is at a depth of 1 foot to 3 feet. Generally, the tilth of this soil is good. The subsoil is generally low in available phosphorus and very low in available potassium. The surface layer is about 3 to 4 percent organic matter.

Most areas of this soil are in cultivated crops. A few undrained areas are used for pasture. This soil has good potential for cultivated crops and pasture. It has fair potential for trees and poor potential for most engineering uses.

This soil is well suited to corn, soybeans, and small grains. It is also well suited to grasses for hay and pasture. The soil puddles if it is worked when wet. Subsurface drains are needed on foot slopes and alluvial fans because seepage from soils on the uplands makes this soil wet. In some of these areas, runoff water from higher, eroding, more sloping soils creates siltation, which can hamper crop production. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps to improve fertility and maintain good tilth. The need for lime in the surface layer varies according to previous liming practices. Generally, lime is needed if it has not been applied in the past 3 to 5 years.

If this soil is used for pasture, grazing should be restricted during wet periods. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is in capability subclass IIw.

54—Zook silty clay loam, 0 to 2 percent slopes. This nearly level, poorly drained soil is on alluvial flood plains and in shallow depressions. It is some distance from the main stream channel. This soil is subject to occasional flooding. Individual areas are broad and elongated in shape and are usually 50 to 100 acres in size.

Typically, the surface layer is black, friable silty clay loam about 9 inches thick. The subsurface layer is black, firm and friable silty clay loam about 30 inches thick. The subsoil is black, firm silty clay loam mottled with olive gray. To a depth of about 60 inches, the substratum is mottled gray, olive gray, and dark gray silty clay loam that is firm.

Included with this soil in some mapping units adjacent to streams are areas where 10 to 20 inches of silt loam overwash cover the surface. These areas are low in organic matter but are easy to till. They make up between 5 to 10 percent of the unit.

This soil has slow permeability. Surface runoff is slow, and water can pond in depressional areas. The available water capacity is high. This soil has a seasonal high water table at a depth of 1 foot to 3 feet. The tilth of this soil is fair. The subsoil is generally low in available phosphorus and very low in available potassium. The surface layer is about 6 to 8 percent organic matter.

Most areas of this soil are in cultivated crops and hay. This soil has good potential for cultivated crops, hay, and pasture. It has fair potential for trees and has poor potential for most engineering uses.

This soil is well suited to corn, soybeans, and small grains and to grasses for hay and pasture. This soil has a tendency to puddle if it is worked when wet. If this soil is used for cultivated crops, subsurface or surface drains allow more timely field operations. Adequate outlets are not available in some areas. Where subsurface drainage

systems are installed, proper spacing of drains is essential because of the slowly permeable subsoil. Harvest is sometimes delayed because the crops tend to mature more slowly. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and maintain soil tilth. The need for lime in the surface layer varies according to previous liming practices. Generally, lime is needed if it has not been applied in the past 3 to 5 years.

Without drainage this soil is better suited to pasture than to crops. When used for pasture, grazing should be restricted during wet periods. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is in capability subclass IIw.

63C—Chelsea loamy fine sand, 5 to 9 percent slopes. This moderately sloping, excessively drained soil is in uplands and on benches along streams. It is on mound-shaped ridges and side slopes. Individual areas are irregular in shape and are usually 5 to 50 acres in size.

Typically, the surface layer is dark brown, very friable loamy fine sand. It is a plow layer about 7 inches thick. The subsurface layer is dark yellowish brown, very friable loamy fine sand and yellowish brown, loose fine sand abut 27 inches thick. The subsoil is about 18 inches thick. It is light yellowish brown, loose fine sand. The substratum is yellowish brown and light yellowish brown, loose fine sand to a depth of about 60 inches.

The soil has rapid permeability. Surface runoff is medium. The available water capacity is very low. Generally, this soil is acid. The subsoil is generally very low in available phosphorus and potassium. The surface layer is less than one-half percent organic matter.

Most areas of this soil are in hay and pasture. This soil has poor potential for cultivated crops but fair potential for hay, pasture, and trees. It has fair potential for most engineering uses, but there is a pollution hazard when the soil is used for onsite sewage treatment.

This soil is poorly suited to cultivated crops. It is better suited to grasses and legumes for hay and pasture.

If this soil is used for cultivated crops, it is subject to wind and water erosion. This soil is very droughty unless rainfall is above normal and timely. As this soil dries out, traction of farm machinery can become difficult because of the soil's very friable to loose consistence. If not protected by vegetation or crop residue, the blowing sand can damage newly seeded crops in the surrounding area. Conservation practices that leave crop residue on the surface help reduce soil erosion and conserve moisture. In addition, contour stripcropping helps reduce soil erosion and conserve moisture. Returning crop residue to the surface or the regular addition of other organic material into the plow layer also helps improve soil fertility and helps stabilize sand blowouts. Because of the acidity, this soil needs lime if it has not been applied in the past 3 or 4 years.

The use of this soil for pasture or hay is an effective way of controlling erosion. Proper stocking rates; pasture rotation; and timely deferment of grazing, especially during dry periods, help keep the pasture and soil in good condition.

This soil is moderately well suited to trees. Some areas are being used for windbreaks or commercial tree plantings. A few areas still remain in native hardwoods. Tree seeds, cuttings, and seedlings survive and grow if precipitation is above normal and timely. Seedling mortality is a concern on this sandy soil, and supplemental water is generally needed. Competing vegetation should be controlled or removed by site preparation; by prescribed burning; or by spraying, cutting, or girdling.

This soil is in capability subclass IVs.

63E—Chelsea loamy fine sand, 9 to 18 pecent slopes. This strongly sloping to moderately steep, excessively drained soil is in uplands. It is on mound-shaped ridges and side slopes. Individual areas are irregular in shape and are usually 10 to 75 acres in size.

Typically, the surface layer is dark brown, very friable loamy fine sand. It is a plow layer about 7 inches thick. The subsurface layer is dark yellowish brown, very friable loamy fine sand and yellowish brown, loose fine sand about 25 inches thick. The subsoil is about 16 inches thick. It is light yellowish brown, loose fine sand. The substratum is yellowish brown and light yellowish brown, loose fine sand to a depth of about 60 inches.

This soil has rapid permeability. Surface runoff is medium. The available water capacity is very low. Generally, this soil is acid. The subsoil is very low in available phosphorus and potassium. The surface layer is less than one-half percent organic matter.

Most areas of this soil are in hay and pasture. This soil has poor potential for cultivated crops, hay, and pasture but fair potential for trees. It has poor potential for most engineering uses, and there is a pollution hazard when the soil is used for onsite sewage treatment.

This soil is poorly suited to cultivated crops. It is better suited to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, it is subject to wind and water erosion. This soil is very droughty unless rainfall is above normal and timely. As this soil dries out, traction of farm machinery can become difficult because of the soil's very friable to loose consistence. If not protected by vegetation or crop residue, the blowing sand can damage newly seeded crops in the surrounding area. Conservation practices that leave crop residue on the surface help reduce soil erosion and conserve moisture. In addition, contour stripcropping helps reduce soil erosion. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve soil fertility and helps

stabilize sand blowouts. Because of its acidity, the soil needs lime if it has not been applied in the past 3 or 4 years.

The use of this soil for pasture or hay is an effective way of controlling erosion. Proper stocking rates; pasture rotation; and timely deferment of grazing, especially during dry periods, help keep the pasture and soil in good condition.

This soil is moderately well suited to trees. A few areas are being used for windbreaks or commercial tree plantings. Some areas still remain in native hardwoods. Tree seeds, cuttings, and seedlings survive and grow if precipitation is above normal and timely. Seedling mortality is a concern on this sandy soil, and supplemental water generally is needed. Competing vegetation should be controlled or removed by site preparation; by prescribed burning; or by spraying, cutting, or girdling.

This soil is in capability subclass VIIs.

63G—Chelsea loamy fine sand, 18 to 30 percent slopes. This steep to very steep, excessively drained soil is in uplands. It is on mound-shaped ridges and side slopes. Individual areas are irregular in shape and are usually 50 acres or more in size.

Typically, the surface layer is dark brown, very friable loamy fine sand. It is about 3 inches thick. The subsurface layer is dark yellowish brown, very friable loamy fine sand and yellowish brown, loose fine sand about 24 inches thick. The subsoil is about 15 inches thick. It is light yellowish brown, loose fine sand. The substratum is yellowish brown and light yellowish brown, loose fine sand to a depth of about 60 inches.

This soil has rapid permeability. Surface runoff is rapid. The available water capacity is very low. Generally, this soil is acid. The subsoil is generally very low in available phosphorus and potassium. The surface layer is less than one-half percent organic matter.

Most areas of this soil are in woodland and pasture. This soil has poor potential for cultivated crops, hay, and pasture but fair potential for trees. It has poor potential for most engineering uses, and there is a pollution hazard when the soil is used for onsite sewage treatment.

This soil is not suited to cultivated crops or hay. It is better suited to grasses and legumes for pasture. Ordinary farm machinery cannot be used on this soil because of the steepness of slope. This soil is subject to wind and water erosion if it is not protected by vegetation. The blowing sand can damage newly seeded crops on adjoining soils. This soil is very droughty. Applying crop residue to the surface or the addition of other organic materials into the plow layer helps improve soil fertility and helps stabilize sand blowouts. The soil needs additions of lime every 3 or 4 years, if it is possible to use the application equipment on these slopes.

The use of this soil for pasture is an effective way of controlling erosion. This soil produces low amounts of forage unless rainfall is above normal and timely. Pasture yields are also very low in the many areas where slopes are so steep that fertilizer and lime application is not possible. Proper stocking rates; pasture rotation; and timely deferment of grazing, especially during dry periods, help keep the pasture and soil in good condition.

This soil is moderately well suited to trees. Many areas still remain in native hardwoods. Tree seeds, cuttings, and seedlings survive and grow if precipitation is above normal and timely. Seedling mortality is a concern on this sandy soil, and supplemental water is generally needed. Competing vegetation should be controlled or removed by site preparation; by prescribed burning; or by spraying, cutting, or girdling. There is a moderate erosion hazard. A vegetative cover should be maintained. Special equipment might be needed because of the slopes.

This soil is in capability subclass VIIs.

65E2—Lindley loam, 14 to 18 percent slopes, moderately eroded. This moderately steep, well drained soil is in uplands. It is on short, convex side slopes. Individual areas are narrow and irregular in shape and are usually 5 to 10 acres in size.

Typically, the surface layer is about 6 inches of dark grayish brown, friable loam mixed with brown clay loam material from the subsoil. The subsoil is about 34 inches thick. The upper part is brown, firm clay loam. The middle part is yellowish brown, firm clay loam. The lower part is yellowish brown, firm clay loam mottled with light brownish gray. To a depth of about 60 inches, the substratum is yellowish brown, firm loam with light brownish gray mottles.

Included with this soil in mapping are a few small areas of clay or heavy clay loam soils, which are less well drained. These areas are on high shoulders and make up less than 5 percent of the unit.

This soil has moderately slow permeability. Surface runoff is rapid. The available water capacity is high. The subsoil is medium in available phosphorus and very low in available potassium. The surface layer is about 1/2 to 1 percent organic matter.

Most areas of this soil are in hay and pasture. This soil has poor potential for cultivated crops but has fair potential for hay, pasture, and trees. It has poor potential for most engineering uses.

This soil is poorly suited to corn. It is better suited to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, it is subject to severe erosion. It is difficult to till and tends to puddle if worked when wet. This soil is poorly suited to terracing because of the short, moderately steep slopes. Cultivated crops should be grown only to reestablish seeding. The need for lime in the surface layer varies according to liming practices. Generally, this soil needs lime if it has not been applied in the past 3 or 4 years.

The use of this soil for pasture or hay is an effective way of controlling erosion. Overgrazing or grazing when

the soil is too wet, however, causes surface compaction, increased runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is moderately suited to trees. A vegetative cover should be maintained to reduce erosion. Special equipment might be needed because of the steep slopes. Seedlings need to be fertilized heavily because of low fertility in the subsoil.

This soil is in capability subclass VIe.

65E3—Lindley clay loam, 14 to 18 percent slopes, severely eroded. This moderately steep, well drained soil is in uplands. It is on short, convex side slopes. Individual areas are narrow and irregular in shape and are usually 5 to 20 acres in size.

Typically, the surface layer is brown, firm clay loam. It is a plow layer about 6 inches thick. The subsoil is about 30 inches thick. The upper part is brown, firm clay loam. The middle part is yellowish brown, firm clay loam. The lower part is yellowish brown, firm clay loam with light brownish gray mottles. To a depth of about 60 inches, the substratum is yellowish brown, firm loam mottled with light brownish gray.

Included with this soil in mapping are a few small areas of clay or heavy clay loam soils, which are less well drained. These areas are on high shoulders and make up less than 5 percent of the unit.

This soil has moderately slow permeability. Surface runoff is rapid. The available water capacity is high. The subsoil is generally medium in available phosphorus and very low in available potassium. The surface layer is less than one-half percent organic matter. This soil has more runoff and less infiltration of water than the less eroded Lindley soils.

Most areas of this soil are in hay and pasture. This soil has poor potential for cultivated crops and trees but has fair potential for hay and pasture. It has a poor potential for most engineering uses.

This soil is poorly suited to corn. It is better suited to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, it is subject to crusting after hard rains and to further erosion. Seedling development is retarded if crusting occurs prior to emergence. This soil is difficult to till and tends to puddle if worked when wet. Contour stripcropping and conservation practices that leave crop residue on the surface help reduce soil loss. This soil is poorly suited to terracing because of the short, moderately steep slopes. Since the plow layer mainly consists of subsoil material, this eroded soil is less responsive to fertilizer. It requires additional management practices to obtain the same crop production of the less eroded Lindley soils. Returning crop residue to the surface or the regular addition of other organic material into the subsoil helps improve fertility, reduce crusting, and increase the infiltration of water. The need for lime in the surface layer varies according to previous liming practices. Generally, the soil needs lime if it has not been applied in the past 3 or 4 years.

The use of this soil for pasture or hay is an effective way of controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, increased runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is poorly suited to trees. It is difficult to get tree seeds, cuttings, and seedlings to survive on this severely eroded soil. The soil material left in these areas is very unfavorable for young seedlings. Seedlings need to be fertilized heavily. A plant cover should be maintained to reduce erosion. Special equipment might be needed because of the steep slopes.

This soil is in capability subclass VIe.

65F2—Lindley loam, 18 to 25 percent slopes, moderately eroded. This steep, well drained soil is in uplands. It is on short, convex side slopes. Individual areas are narrow and irregular in shape and are usually 5 to 10 acres in size.

Typically, the surface layer is about 6 inches of dark grayish brown, friable loam mixed with brown, firm clay loam material from the subsoil. The subsoil is about 32 inches thick. The upper part is brown, firm clay loam. The middle part is yellowish brown, firm clay loam. The lower part is yellowish brown, firm clay loam mottled with light brownish gray. To a depth of about 60 inches, the substratum is yellowish brown, firm loam with light brownish gray mottles.

This soil has moderately slow permeability. Surface runoff is rapid. The available water capacity is high. The subsoil is generally medium in available phosphorus and very low in available potassium. The surface layer is about 1/2 to 1 percent organic matter.

Most areas of this soil are in hay and pasture. This soil has poor potential for cultivated crops and fair potential for hay, pasture, and trees. It has poor potential for most engineering uses.

This soil is poorly suited to cultivated crops. It is better suited to grasses and legumes for hay and pasture. The operation of ordinary farm machinery is difficult on these soils because of the steepness of slope and the presence of gullies and drainageways that cannot be crossed.

If this soil is used for cultivated crops, it is subject to crusting after hard rains and severe erosion. Seedling development is retarded if crusting occurs prior to emergence. This soil is difficult to till and tends to puddle if worked when wet. Crops that require tillage should be grown only to reestablish grasses and legumes for hay and pasture. Since the plow layer is mixed with the subsoil, this soil is generally less responsive to fertilizer and might require additional management practices. The need for lime in the surface layer varies according to

previous practices. Generally, the soil needs lime if it has not been applied in the past 3 or 4 years.

The use of this soil for pasture is effective in controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction and excessive runoff. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is moderately suited to trees. Trees seeds, cuttings, and seedlings are difficult to establish because of low fertility in the subsoil. Heavy fertilization is needed. Special equipment might be needed because of the steep slopes.

This soil is in capability subclass VIIe.

65F3—Lindley clay loam, 18 to 25 percent slopes, severely eroded. This steep, well drained soil is in uplands. It is on short, convex side slopes. Individual areas are narrow and irregular in shape and are usually 5 to 15 acres in size.

Typically, the surface layer is brown, firm clay loam. It is a plow layer about 6 inches thick. The subsoil is about 28 inches thick. The upper part is brown, firm clay loam. The middle part is yellowish brown, firm clay loam. The lower part is yellowish brown, firm clay loam mottled with light brownish gray. To a depth of about 60 inches, the substratum is yellowish brown, firm loam with light brownish gray mottles.

This soil has moderately slow permeability. Surface runoff is rapid. The available water capacity is high. The subsoil is generally medium in available phosphorus and very low in available potassium. The surface layer is less than one-half percent organic matter. This soil has more runoff and less infiltration of water than the less eroded Lindley soils.

Most areas of his soil are in hay and pasture. The soil has poor potential for cultivated crops and trees. It has fair potential for hay and pasture. It has poor potential for most engineering uses.

This soil is poorly suited to corn. It is better suited to grasses and legumes for hay and pasture. The operation of ordinary farm machinery is difficult on these soils because of the steepness of slope and the presence of gullies and drainageways that cannot be crossed. If this soil is used for cultivated crops, it is subject to crusting after hard rains and to further erosion. Seedling development is retarded if crusting occurs prior to emergence. This soil is difficult to till and tends to puddle if worked when wet. Crops that require tillage should be grown only to reestablish grasses and legumes for hay and pasture. Since the plow layer mainly consists of material from the subsoil, this eroded soil is less responsive to fertilizer and requires additional management practices to obtain the same crop production as the less eroded Lindley soils. The need for lime in the surface layer varies according to previous liming practices. Generally, this soil needs lime if it has not been applied in the past 3 or 4 years.

The use of this soil for pasture is effective in controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction and excessive runoff. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is poorly suited to trees. Survival is difficult for tree seeds, cuttings, and seedlings on this severely eroded soil. The soil material left in these areas is very unfavorable for young seedlings. Seedlings need to be fertilized heavily because of the low fertility of the subsoil. A vegetative cover should be maintained to reduce erosion. Special equipment might be needed because of the steep slopes.

This soil is in capability subclass VIIe.

65G—Lindley loam, 25 to 40 percent slopes. This very steep, well drained soil is in uplands. It is on short, convex side slopes. Individual areas are narrow and irregular in shape and are usually 5 to 15 acres in size.

Typically, the surface layer is dark grayish brown, friable loam about 3 inches thick. The subsurface layer is grayish brown, friable loam about 5 inches thick. The subsoil is about 30 inches thick. The upper part is brown, firm clay loam. The middle part is yellowish brown, firm clay loam. The lower part is yellowish brown, firm clay loam mottled with light brownish gray. To a depth of about 60 inches, the substratum is yellowish brown, firm loam with light brownish gray mottles.

This soil has moderately slow permeability. Surface runoff is very rapid. The available water capacity is high. Generally, this soil is acid. If cultivated, this soil has fair tilth. The subsoil is generally medium in available phosphorus and very low in available potassium. The surface layer is about 1/2 to 1 percent organic matter.

Most areas of this soil are used for trees. This soil has poor potential for cultivated crops, hay, and pasture. It has fair potential for trees. It has poor potential for most engineering uses.

This soil is not suited to cultivated crops or hay. Ordinary farm machinery cannot be used on this soil because of the steepness of slope. Also, because slopes are steep and runoff is rapid, this soil can be very erosive if left unprotected. Because of acidity, this soil needs additions of lime every 3 or 4 years, if it is possible to get the application equipment on these slopes.

This soil is poorly suited to pasture. Grazing must be limited. Pasture forage is low in the many areas where slopes are so steep that fertilizer and lime application is not possible.

This soil is moderately suited to trees, and most areas remain in native hardwoods. These areas of native hardwoods can be kept in relatively productive timber by good management practices. Such practices include protection from livestock and fire, group selective cutting, and improved cutting practices. There is a moderate

erosion hazard. A vegetative cover should be maintained. Special equipment might be needed because of the steep slopes.

This soil is in capability subclass VIIe.

65G3—Lindley clay loam, 25 to 40 percent slopes, severely eroded. This very steep, well drained soil is in uplands. It is on short, convex side slopes. Individual areas are narrow and irregular in shape and are usually 5 to 15 acres in size.

Typically, the surface layer is a brown, firm clay loam about 6 inches thick. The subsoil is about 25 inches thick. The upper part is brown, firm clay loam. The middle part is yellowish brown, firm clay loam. The lower part is yellowish brown, firm clay loam mottled with light brownish gray. To a depth of about 60 inches, the substratum is yellowish brown, firm loam with light brownish gray mottles.

This soil has moderately slow permeability. Surface runoff is very rapid. The available water capacity is high. Generally, this soil is acid. The subsoil is generally medium in available phosphorus and very low in available potassium. The surface layer is less than one-half percent organic matter.

Primarily, all areas of this soil are a landscape of permanent pasture and some trees. This soil has poor potential for cultivated crops, hay, pasture, and trees. It has poor potential for most engineering uses.

This soil is not suited to growing cultivated crops or hay. When cultivated, this soil is very difficult to till and tends to puddle if worked when wet. Ordinary farm machinery cannot be used on this soil because of the steepness of slope. If this soil is used for cultivation of any type, the remaining surface is difficult to stabilize because of a low rate of infiltration and very rapid runoff on the very steep slopes. This soil has less infiltration and more runoff than the less eroded Lindley soils. Because of acidity, this soil needs additions of lime every 3 or 4 years, if it is possible to get the application equipment on these slopes.

This soil is poorly suited to pasture. There is a greater need to limit grazing on this soil than on the less eroded Lindley soils. Erosion has left this soil less productive. Generally, this soil cannot yield as much forage as less eroded soils. Pasture forage is very low in the many areas where slopes are so steep that fertilizer and lime application is not possible.

This soil is poorly suited to trees. It is difficult for tree seeds, cuttings, and seedlings to survive on this severely eroded soil. The soil material left in these areas is very unfavorable for establishing young seedlings. Seedlings need to be fertilized heavily because of the low fertility of the subsoil. A plant cover should be maintained to reduce erosion. Special equipment might be needed because of the steep slopes.

This soil is in capability subclass VIIe.

83B—Kenyon loam, 2 to 5 percent slopes. This gently sloping, moderately well drained soil is in uplands. It is on convex ridges and side slopes. Individual areas are irregular in shape and are usually 30 to 60 acres in size.

Typically, the surface layer is black, friable loam and is about 6 inches thick. The subsurface layer is black and very dark grayish brown, friable loam about 10 inches thick. The subsoil is about 28 inches thick. The upper part is brown, friable loam. The middle part is yellowish brown, firm loam mottled with grayish brown and strong brown. The lower part is yellowish brown, firm loam with grayish brown mottles. To a depth of about 60 inches, the substratum is yellowish brown, firm loam with grayish brown mottles.

Included with this soil in mapping are a few small scattered areas where the surface layer is sandy. These soils are on convex knolls and are droughty. They make up less than 5 percent of the unit.

This soil is moderately permeable. The upper part of the soil is more permeable than the lower part of the subsoil and the substratum. Surface runoff is medium. The availabe water capacity is high. The subsoil is very low in available phosphorus and potassium. The surface layer is about 3 to 4 percent organic matter.

Most areas of this soil are in cultivated crops. The soil has good potential for cultivated crops, hay, pasture, and trees. It has fair potential for most engineering uses.

This soil is well suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, it is subject to erosion. Contour stripcropping and conservation practices that leave crop residue on the surface help reduce soil loss. Many areas have slopes long and smooth enough to be terraced and farmed on the contour. Since the loamy overburden is more permeable than the glacial till, water accumulates on contact with the glacial till, moves laterally, and creates wet seepy areas in some years. Because this soil is subject both to erosion and seasonal wetness, a combination of terracing and subsurface drains would be beneficial in some areas. The soil is easy to till but tends to puddle if worked when wet. Cuts for terraces should be held to a minimum to avoid exposure of the underlying glacial till, which is low in fertility. Stones from the subsoil hinder tillage. Returning crop residue to the surface layer or the regular addition of other organic material into the plow layer helps improve fertility and good tilth. The need for lime in the surface layer varies according to previous liming practices. Generally, the soil needs lime if it has not been applied in the past 3 or 4 years.

The use of this soil for pasture or hay is an effective way of controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, increased runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is in capability subclass IIe.

83C—Kenyon loam, 5 to 9 percent slopes. This moderately sloping, moderately well drained soil is in uplands. It is on convex ridges and side slopes. Individual areas are long and irregular in shape and are usually 25 to 75 acres in size.

Typically, the surface layer is black, friable loam about 6 inches thick. The subsurface layer is very dark grayish brown, friable loam about 5 inches thick. The subsoil is about 28 inches thick. The upper part is brown, friable loam. The middle part is yellowish brown, firm loam with grayish brown and strong brown mottles. The lower part is yellowish brown heavy loam mottled with grayish brown. To a depth of about 60 inches, the substratum is yellowish brown, firm loam with grayish brown mottles.

Included with this soil in mapping are a few, small scattered areas of sandy soils. These soils are on convex knolls and are droughty. These areas make up less than 5 percent of the unit.

This soil is moderately permeable. The upper part of the soil is more permeable than the lower part of the subsoil and the substratum. Surface runoff is medium. The available water capacity is high. This soil has good tilth. The subsoil is generally very low in available phosphorus and potassium. The surface layer is about 3 to 4 percent organic matter.

Most areas of this soil are in cultivated crops. The soil has good potential for cultivated crops, hay, pasture, and trees. It has fair potential for most engineering uses.

This soil is well suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, it is subject to erosion. Contour stripcropping and conservation practices that leave crop residue on the surface help reduce soil loss. Many areas have slopes long and smooth enough to be terraced and farmed on the contour. Since the loamy overburden is more permeable than the glacial till, water accumulates on contact with the glacial till, moves laterally and creates wet seepy areas in some years. The soil tends to puddle if worked when wet. Since this soil is subject both to erosion and to seasonal wetness, a combination of terracing and subsurface drains is beneficial in some areas. Cuts for terraces should be held to a minimum to avoid exposure of the underlying glacial till, which is low in fertility. Stones from the subsoil can hinder tillage. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and maintain good tilth. The need for lime in the surface layer varies according to previous liming practices. Generally, this soil needs lime if it has not been applied in the past 3 or 4 years.

The use of this soil for pasture or hay is an effective way of controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, increased runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is in capability subclass IIIe.

83C2—Kenyon loam, 5 to 9 percent slopes, moderately eroded. This moderately sloping, moderately well drained soil is in uplands. It is on convex ridges and side slopes. Individual areas are irregular in shape and are usually 10 to 30 acres in size.

Typically, the surface layer is about 6 inches of dark brown or very dark grayish brown, friable loam mixed with brown, friable loam material from the subsoil. The subsoil is about 25 inches thick. The upper part is brown, friable loam. The middle part is yellowish brown, firm loam mottled with grayish brown and strong brown. The lower part of the subsoil is yellowish brown, firm loam with grayish mottles. To a depth of 60 inches, the substratum is yellowish brown, firm loam with grayish brown mottles.

Included with this soil in mapping are a few, small scattered areas of sandy soils. These sandy soils are on convex knolls and are droughty. A few areas of soils where glacial till is exposed at the surface are on low shoulders. These soils are low in fertility and less productive. These areas make up 5 to 10 percent of the unit.

This soil is moderately permeable. The upper part of the soil is more permeable than the lower part of the subsoil and the substratum. Surface runoff is medium. The available water capacity is high. This soil is fairly easy to till. The subsoil is generally very low in available phosphorus and potassium. The surface layer is about 2 to 3 percent organic matter.

Most areas of this soil are in cultivated crops and hay. This soil has fair potential for cultivated crops but has good potential for hay, pasture, and trees. It has fair potential for most engineering uses.

This soil is suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, it is subject to further erosion. Contour stripcropping and conservation practices that leave crop residue on the surface help reduce soil loss. Since the loamy overburden is more permeable than the glacial till, water accumulates on contact with the glacial till, moves laterally, and creates wet seepy areas in some years. The soil tends to puddle if worked when wet. Since this soil is subject both to erosion and to seasonal wetness, a combination of terracing and subsurface drains would be beneficial in some areas. Cuts for terraces should be held to a minimum to reduce exposure of the underlying glacial till, which is low in fertility. The glacial till can hinder tillage. Since the plow layer is mixed with the subsoil, this soil is generally less responsive to fertilizer and can require additional management practices. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and maintain tilth of the soil. The need for lime in the surface layer varies according to previous liming practices. Generally, this soil needs lime if it has not been applied in the past 3 or 4 years.

The use of this soil for pasture or hay is an effective way of controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, increased runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is in capability subclass IIIe.

84—Clyde silty clay loam, 0 to 2 percent slopes. This nearly level, poorly drained soil is in drainageways and low, concave positions of glacial uplands. This soil is subject to frequent flooding. Individual areas are broad and irregualr in shape and are usually 10 to 40 acres in size.

Typically, the surface layer is black, friable silty clay loam about 7 inches thick. The subsurface layer is black, friable silty clay loam about 11 inches thick. The subsoil is about 42 inches thick. The upper part is grayish brown, friable loam with yellowish brown mottles. The middle part is gray and light gray, friable loam and clay loam with yellowish brown mottles. The lower part is mottled light olive gray and brownish yellow, firm loam.

Included with this soil in mapping are a few small areas of Schley soils. The somewhat poorly drained Schley soils are on slightly higher toe slopes, are seepy in wet years, and are low in organic matter. These areas make up less than 5 percent of the unit.

This soil is moderately permeable. The upper part of the soil is more permeable than the lower part of the subsoil. Surface runoff is slow. The available water capacity is very high. A seasonal high water table is at 1 foot to 2 1/2 feet. This soil has good tilth. It tends to puddle if worked when wet. Generally, this soil has a neutral reaction throughout. The subsoil is generally very low in available phosphorus and potassium. The surface layer is about 7 to 11 percent organic matter.

Most areas of this soil are in cultivated crops or pasture. The soil has good potential for cultivated crops, hay, and pasture and fair potential for trees. It has poor potential for most engineering uses.

This soil is well suited to corn, soybeans, and small grains and to grasses for hay and pasture. This soil can be used for intensive row crops if adequately drained and properly managed. The wetness of this soil is caused by a high water table and sidehill seepage from soils upslope. The soil tends to puddle if worked when wet. A subsurface drainage system that intercepts the laterally moving water is beneficial and allows more timely field operations. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and maintain tilth of the soil. Because the soil is neutral, the addition of lime is seldom needed.

Areas of this soil that are not adequately drained are generally used for pasture. If this soil is used for pasture, grazing shold be restricted during wet periods. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is in capability subclass IIw.

88—Nevin silty clay loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on benches adjacent to major streams and rivers. Some areas could be flooded if stream levels are above normal. Individual areas are broad and irregular in shape and are usually 40 to 100 acres in size.

Typically, the surface layer is black, friable silty clay loam about 9 inches thick. The subsurface layer is black and very dark grayish brown, friable silty clay loam about 15 inches thick. The subsoil is about 34 inches thick. The upper part is dark grayish brown and grayish brown, friable sity clay loam with yellowish brown mottles. The middle part is grayish brown, friable silty clay loam with yellowish brown mottles. The lower part is grayish brown and light brownish gray, friable silty clay loam with yellowish brown mottles. The substratum is mottled strong brown and light brownish gray, friable silt loam to a depth of about 60 inches.

Included with this soil in mapping are a few areas of soils which are in lower lying swales and which are poorly drained. Field operations on these soils can be delayed during wet years. These areas make up less than 5 percent of the unit.

This soil has moderate permeability. Surface runoff is slow. The available water capacity is very high. This soil has a seasonal high water table at 2 to 4 feet. The tilth of this soil is good. The subsoil is generally very low in available phosphorus and potassium. The surface layer is about 5 to 6 percent organic matter.

Most areas of this soil are in cultivated crops. This soil has good potential for cultivated crops, hay, pasture, and trees. It has poor potential for most engineering uses.

This soil is well suited to corn, soybeans, and small grains. It is also well suited to grasses and legumes for hay and pasture. It has a tendency to puddle if worked when wet. Subsurface drains are beneficial in wet years if adequate outlets are available. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and maintain good tilth. The need for lime in the surface layer varies according to previous liming practices. Generally, this soil needs lime if it has not been applied in the past 3 to 5 years.

If this soil is used for pasture, grazing should be restricted during wet periods. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is in capabilty class I.

110C—Lamont fine sandy loam, 3 to 8 percent slopes. This gently sloping and moderately sloping,

somewhat excessively drained soil is in uplands and on benches along streams. It is on convex ridges and side slopes. Individual areas are oblong and irregular in shape and are usually 5 to 10 acres in size.

Typically, the surface layer is very dark grayish brown, very friable fine sandy loam about 5 inches thick. The subsurface layer is dark grayish brown, very friable fine sandy loam about 4 inches thick. The subsoil is about 21 inches thick. The upper part is brown, very friable fine sandy loam. The middle part is brown, very friable sandy loam. The lower part is dark yellowish brown, very friable sandy loam. The substratum is yellowish brown, very friable loamy sand and thin bands of brown, friable sandy loam to a depth of 60 inches. In cultivated areas the surface and subsurface layers are incorporated together into a plow layer.

Included with this soil in mapping are a few scattered areas of Chelsea and Fayette soils. The Chelsea soils contain less clay and are more droughty than the Lamont soil. The Fayette soils contain more clay than the Lamont soil and are more productive. These areas make up 5 to 10 percent of the unit.

This soil has moderately rapid permeability in the subsoil and rapid permeability in the substratum. The available water capacity is low. This soil has good tilth. This soil generally is acid in the surface layer. The subsoil is generally medium in available phosphorus and very low in available potassium. The surface layer is less than one-half percent organic matter.

Most areas of this soil are in cultivated crops, hay, and pasture. The soil has good potential for cultivated crops but fair potential for hay, pasture, and trees. It has fair potential for most engineering uses, but there is a pollution hazard when the soil is used for onsite sewage treatment.

This soil is poorly suited to corn, soybeans, and small grain. It is better suited to grasses and legumes for hay and pasture.

If this soil is used for cultivated crops, it is subject to wind and water erosion. This soil is droughty, and all crop yeilds are dependent on amount and timeliness of rainfall. Conservation practices that leave crop residue on the surface help reduce soil erosion and conserve moisture. In addition, stripcropping helps reduce soil erosion. Returning crop residue or the regular addition of other organic material into the plow layer helps improve soil fertility. The need for lime in the surface layer varies according to previous liming practices. Because of the acidity, this soil needs lime if it has not been applied in the past 3 or 4 years.

The use of this soil for pasture or hay is an effective way of controlling erosion. Proper stocking rates; pasture rotation; and timely deferment of grazing, especially during dry periods, help keep the pasture and soil in good condition.

This soil is moderately suited to conifers and upland hardwoods. A few areas still remain in native timber. Tree seeds, cuttings, and seedlings survive and grow if precipitation is normal and timely. Competing vegetation should be controlled or removed by site preparation; by prescribed burning; or by spraying, cutting, or girdling.

This soil in capabiltiy subclass IIIe.

118—Garwin silty clay loam, 0 to 2 percent slopes. This nearly level, poorly drained soil is on concave slopes, at the heads of drainageways, or in slight depressions on flats in uplands. Individual areas are irregular in shape and are usually 10 to 30 acres in size.

Typically, the surface layer is black, friable silty clay loam about 7 inches thick. The subsurface layer is black, friable silty clay loam about 11 inches thick. The subsoil is 32 inches thick. The upper part is dark gray, friable silty clay loam with very dark gray coatings. The lower part is olive gray, friable silty clay loam with dark gray coatings and yellowish brown and brown mottles. To a depth of about 60 inches, the substratum is olive gray, friable silt loam with dark gray coatings and yellowish brown mottles.

Included with this soil in mapping are small areas of Muscatine soils. These soils are on higher, convex positions of the landscape than this Garwin soil. These areas make up less than 5 percent of the unit.

This soil is moderately permeable. Surface runoff is slow. The available water capacity is high. A seasonal high water table is at 1 foot. This soil has good tilth. Generally, this soil is neutral in the surface layer. The subsoil is low in available phosphorus and very low in available potassium. The surface layer is about 6 to 7 percent organic matter.

Most areas of this soil are in cultivated crops. This soil has good potential for cultivated crops, hay, and pasture but fair potential for trees. It has poor potential for most engineering uses.

This soil is well suited to corn, soybeans, and small grains and to grasses for hay and pasture. This soil is suited to intensive use for row crops but is wet during the spring. It puddles if worked when wet. Artificial drains are needed to lower the water table and improve timeliness of field operations. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and maintain tilth of the soil. Generally, this soil does not need lime.

If this soil is used for pasture, grazing should be restricted during wet periods. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is in capability subclass IIw.

119—Muscatine silt loam, 1 to 3 percent slopes. This very gently sloping, somewhat poorly drained soil is in uplands. It is on convex side slopes above drainageways. Individual areas are smooth and irregular in shape and are usually 20 to 60 acres in size.

Typically, the surface layer is black, friable silt loam about 8 inches thick. The subsurface layer is black and very dark brown, friable silt loam and silty clay loam about 11 inches thick. The subsoil is 36 inches thick. The upper part is dark grayish brown, friable silty clay loam with very dark grayish brown coatings. The middle part is grayish brown, friable silty clay loam with dark brown coatings and strong brown mottles. The lower part is mottled grayish brown and strong brown, friable silty clay loam. The substratum is mottled yellowish brown and grayish brown, friable silt loam to a depth of about 60 inches.

Included with this soil in mapping are small areas of Atterberry and Garwin soils. The Atterberry soils are scattered throughout the unit and have a thinner surface layer, which is lower in organic matter. The Garwin soils are poorly drained and in lower positions. They can be ponded during wet seasons, which delays field operations. These areas make up less than 5 percent of the unit.

This soil has moderate permeability. Surface runoff is slow. The available water capacity is high. A seasonal high water table is at a depth of 2 to 4 feet. This soil has good tilth. The subsoil is low in available phosphorus and very low in available potassium. The surface layer is about 5 to 6 percent organic matter.

Most areas of this soil are used for cultivated crops. The soil has good potential for cultivated crops, hay, pasture, and trees. It has poor potential for most engineering uses.

This soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. This soil can be used for intensive row cropping, but it has a seasonal high water table. It tends to puddle if worked when wet. The use of subsurface drains helps improve the timeliness of field operations in wet years. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and maintain good tilth. The need for lime in the surface layer varies according to liming practices performed in previous years. Generally, this soil needs lime if it has not been applied in the past 3 to 5 years.

If this soil is used for pasture, grazing should be restricted during wet periods. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is in capability class I.

120—Tama silt loam, 0 to 2 percent slopes. This nearly level, well drained soil is in uplands. It is on flat ridges. Individual areas are long and irregular in shape and are usually 10 to 40 acres in size.

Typically, the surface layer is very dark brown, friable silt loam and is about 8 inches thick. The subsurface layer is very dark grayish brown, friable silty clay loam about 11 inches thick. The subsoil is about 25 inches thick. The upper part is brown, friable silty clay loam with dark grayish brown coatings. The middle part is brown, friable silty clay loam. The lower part is brown, friable silty clay loam with yellowish brown mottles. The substratum is dark yellowish brown, friable silty clay loam to a depth of about 60 inches.

Included with this soil in mapping are a few small areas of somewhat poorly drained Muscatine and Atterberry soils. These areas make up less than 5 percent of the unit.

This soil has moderate permeability. Surface runoff is slow. The available water capacity is high. This soil has good tilth. The subsoil is medium in available phosphorus and very low in available potassium. The surface layer is about 3 to 4 percent organic matter.

Most areas of this soil are in cultivated crops. The soil has good potential for cultivated crops, hay, pasture, and trees. It has good potential for most engineering uses.

This soil is well suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. This soil has few, if any, significant limitations for growing row crops intensively. This soil tends to puddle if worked when wet. If this soil is properly managed, crop yields are very good. Returning crop residue to the surface and the regular addition of other organic material into the plow layer improve fertility and maintain good tilth. The need for lime in the surface layer varies according to previous liming practices. Generally, this soil needs lime if it has not been applied in the past 3 to 5 years.

This soil is in capability class I.

120B—Tama silt loam, 2 to 5 percent slopes. This gently sloping, well drained soil is in uplands. It is on convex ridges and side slopes. Individual areas are broad and irregular in shape and are usually 60 to 100 acres or more in size.

Typically, the surface layer is very dark brown, friable silt loam and is about 8 inches thick. The subsurface layer is very dark grayish brown, friable silty clay loam about 11 inches thick. The subsoil is about 25 inches thick. The upper part is brown, friable silty clay loam with dark grayish brown coatings. The middle part is brown, friable silty clay loam. The lower part is brown, friable silty clay loam with yellowish brown mottles. The substratum is dark yellowish brown, friable silty clay loam to a depth of about 60 inches.

This soil has moderate permeability. Surface runoff is medium. The available water capacity is high. This soil has good tilth. The subsoil is medium in available phosphorus and very low in available potassium. The surface layer is about 3 to 4 percent matter.

Most areas of this soil are in cultivated crops. The soil has good potential for cultivated crops, hay, pasture, and trees. It has good potential for most engineering uses.

This soil is well suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture (fig. 7). This soil can be used for intensive row cropping

if erosion is controlled. It tends to puddle if worked when wet. Contour stripcropping and conservation practices that leave crop residue on the surface reduce soil loss. Many areas have slopes that are long and smooth enough to be terraced and farmed on the contour. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and maintain good tilth. The need for lime in the surface layer varies according to previous liming practices. Generally, the soil needs lime if it has not been applied in the past 3 to 5 years.

The use of this soil for pasture or hay is effective in controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, increased runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is in capability subclass IIe.

120C—Tama silt loam, 5 to 9 percent slopes. This moderately sloping, well drained soil is in uplands. It is on convex, narrow ridges and side slopes. Individual areas are broad and irregular in shape and are usually 10 to 200 acres in size.

Typically, the surface layer is very dark brown, friable silt loam about 8 inches thick. The subsurface layer is very dark grayish brown, friable silty clay loam about 4 inches thick. The subsoil is about 24 inches thick. The upper part is brown, friable silty clay loam with dark grayish brown coatings. The middle part is brown, friable silty clay loam. The lower part is brown, friable silty clay loam with yellowish brown mottles. The substratum is dark yellowish brown, friable silty clay loam to a depth of 60 inches.

This soil has moderate permeability. Surface runoff is medium. The available water capacity is high. This soil has good tilth. The subsoil is medium in available phosphorus and very low in available potassium. The surface layer is about 3 to 4 percent organic matter.

Figure 7.—Soybeans growing on gently sloping Tama soils located south of Low Moor, Iowa.

Most areas of this soil are in cultivated crops or hay. The soil has good potential for cultivated crops, hay, pasture, and trees. It has good potential for most engineering uses.

This soil is well suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. This soil is subject to erosion when cultivated. It tends to puddle when wet. Contour stripcropping and conservation practices that leave crop residue on the surface reduce soil loss. Many areas have slopes long and smooth enough to be terraced and farmed on the contour. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and maintain good tilth. The need for lime in the surface layer varies according to previous liming practices. Generally, the soil needs lime if it has not been applied in the past 3 to 5 years.

The use of this soil for pasture or hay is effective in controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, increased runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

The soil is in capability subclass IIIe.

120C2—Tama silt loam, 5 to 9 percent slopes, moderately eroded. This moderately sloping, well drained soil is in uplands. It is on convex, narrow ridges and side slopes. Individual areas are long and irregular in shape and are usually 20 to 40 acres in size.

Typically the surface layer is about 7 inches of very dark grayish brown, friable silt loam mixed with brown, friable silty clay loam material from the subsoil. The subsoil is about 23 inches thick. The upper part is brown, friable silty clay loam. The lower part is brown, friable silty clay loam mottled with yellowish brown. To a depth of about 60 inches, the substratum is dark yellowish brown, friable silty clay loam.

This soil has moderate permeability. Surface runoff is medium. The available water capacity is high. This soil generally has good tilth. The subsoil is medium in available phosphorus and very low in available potassium. The surface layer is about 2 to 3 percent organic matter. This soil has more runoff and less infiltration of water than the uneroded Tama soils.

Most areas of this soil are in cultivated crops or hay. The soil has good potential for cultivated crops, hay, pasture, trees, and for most engineering uses.

This soil is well suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, it is subject to further erosion. It puddles if worked when wet. Contour stripcropping and conservation practices that leave crop residue on the surface reduce soil loss. Many areas have slopes long and smooth enough to be terraced and farmed on the contour. This soil requires more fertilization than the uneroded Tama soils to obtain the same yields. Returning crop residue to the surface and the regular addition of other organic material into the plow layer improve fertility and increase the infiltration of water. The need for lime in the surface layer varies according to previous liming practices. Generally, the soil needs lime if it has not been applied in the past 3 to 5 years.

The use of this soil for pasture or hay is effective in controlling erosion. Overgrazing or grazing when the soil is too wet, however, can cause surface compaction, increased runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is in capability subclass IIIe.

120D—Tama silt loam 9 to 14 percent slopes. This strongly sloping, well drained soil is in uplands. It is on convex side slopes. Individual areas are long and irregular in shape and are usually 40 to 60 acres in size.

Typically, the surface layer is very dark brown to very dark grayish brown, friable silt loam about 10 inches thick. The subsoil is about 24 inches thick. The upper part is brown, friable silty clay loam with dark grayish brown coatings. The middle part is brown, friable silty clay loam. The lower part is brown, friable silty clay loam mottled with yellowish brown. The substratum is dark yellowish brown, friable silty clay loam to a depth of 60 inches.

This soil has moderate permeability. Surface runoff is rapid. The available water capacity is high. This soil has good tilth. The subsoil is medium in available phosphorus and very low in available potassium. The surface layer is about 3 to 4 percent organic matter.

Most areas of this soil are in cultivated crops or hay. The soil has good potential for cultivated crops, hay, pasture, and trees. It has good potential for most engineering uses.

This soil is well suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, it is subject to erosion. The soil tends to puddle if worked when wet. Contour stripcropping and conservation practices that leave crop residue on the surface reduce soil loss. Many areas have slopes long and smooth enough to be terraced and farmed on the contour. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and maintain good tilth. The need for lime in the surface layer varies according to previous liming practices. Generally, this soil needs lime if it has not been applied in the past 3 to 5 years.

The use of this soil for pasture or hay is effective in controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, increased runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is in capability subclass IIIe.

120D2—Tama silt loam, 9 to 14 percent slopes, moderately eroded. This strongly sloping, well drained soil is in uplands. It is on convex side slopes. Individual areas are irregular in shape and are usually 40 to 100 acres or more in size.

Typically, the surface layer is about 6 inches of very dark brown or very dark grayish brown, friable silt loam mixed with brown, friable silty clay loam material from the subsoil. The subsoil is about 22 inches thick. The upper part is brown, friable silty clay loam. The lower part is brown, friable silty clay loam with yellowish brown mottles. The substratum is dark yellowish brown, friable silty clay loam to a depth of about 60 inches.

This soil has moderate permeability. Surface runoff is rapid. The available water capacity is high. This soil generally has good tilth. The subsoil is medium in available phosphorus and very low in available potassium. The surface layer is about 2 to 3 percent organic matter. This soil has more runoff and less infiltration of water than the uneroded Tama soils.

Most areas of this soil are in cultivated crops or hay. The soil has fair potential for cultivated crops and good potential for hay, pasture, and trees. It has fair potential for most engineering uses.

This soil is suited to corn, soybeans, and small grains. It is well suited to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, it is subject to further erosion. This soil puddles if worked when wet. Contour stripcropping and conservation practices that leave crop residue on the surface reduce soil loss. Many areas have slopes long and smooth enough to be terraced and farmed on the contour. The soil requires more fertilization than the uneroded Tama soils to obtain the same yields. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and maintain good tilth. The need for lime in the surface layer varies according to previous liming practices. Generally, this soil needs lime if it has not been applied in the past 3 to 5 years.

The use of this soil for pasture or hay is effective in controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, increased runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is in capability subclass IIIe.

133—Colo silty clay loam, 0 to 2 percent slopes. This nearly level, poorly drained soil is on alluvial flood plains and in narrow drainageways in uplands. This soil is subject to occasional flooding. Individual areas are long and irregular in shape and are usually 100 acres to several hundred acres in size.

Typically, the surface layer is black, friable silty clay loam about 10 inches thick. The subsurface layer is black, friable silty clay loam about 28 inches thick. To a depth of 60 inches, the substratum is very dark gray, dark gray, and olive gray silty clay loam that is friable. Mottles are dark grayish brown.

Included with this soil in mapping are a few areas of Elvira soils in depressions. These soils have a high concentration of iron and do not scour well when plowed. Also included are some areas nearer to the uplands or along the stream channel where the soils have 10 to 20 inches of silt loam overwash. The overwash permits easier plowing and seedbed preparation. These areas make up 10 to 15 percent of the unit.

This soil has moderate permeability. Surface runoff is slow. The available water capacity is high. A seasonal high water table is at a depth of 1 foot to 3 feet. This soil has fair tilth. Reaction is generally nearly neutral or only slightly acid throughout. The subsoil generally has a low level of available phosphorus and is very low in available potassium. The surface layer is about 5 to 7 percent organic matter.

Most areas of this soil are in cultivated crops and hay. A few areas of undrained soils are used for pasture. This soil has good potential for cultivated crops, hay, and pasture but fair potential for trees. It has a poor potential for most engineering uses.

This soil is well suited to corn, soybeans, and small grains and to grasses for hay and pasture. This soil has a tendency to puddle if worked when wet. Cultivation is often delayed unless this poorly drained soil is artificially drained. When installed, subsurface drains work fairly well if adequate outlets are available. Because of flooding, it is difficult to get a good stand of row crops established in some years. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and maintain good tilth. Liming is seldom needed on this soil.

If this soil is used for pasture, grazing should be restricted during wet periods. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is in capability subclass IIw.

133 —Colo silt loam, overwash, 0 to 2 percent slopes. This nearly level, poorly drained soil is on alluvial flood plains. Overwash sediments were deposited from adjacent streams or from small, secondary drainageways in uplands. This soil is subject to frequent flooding. Individual areas are long and irregular in shape and are usually 50 to 80 acres in size.

Typically, the surface soil is dark grayish brown, friable silt loam. It is overwash about 16 inches thick. The underlying, buried surface layer is black, friable silty clay loam about 10 inches thick. The subsurface layer is black, friable silty clay loam about 28 inches thick. To a depth of 60 inches, the substratum is very dark gray,

dark gray, and olive gray silty clay loam that is friable. It is mottled with dark grayish brown.

This soil has moderate permeability. Surface runoff is slow. The available water capacity is high. A seasonal high water table is at a depth of 1 foot to 3 feet. This soil has good tilth. The subsoil generally has a low level of available phosphorus and is very low in available potassium. The surface layer is about 3 to 4 percent organic matter.

Most areas of this soil are in cultivated crops and hay. A few areas of undrained soils are used for pasture. This soil has good potential for cultivated crops, hay, and pasture but fair potential for trees. It has a poor potential for most engineering uses.

This soil is well suited to corn, soybeans, and small grains and to grasses for hay and pasture. This soil puddles if worked when wet. The soil is not as wet as the Colo soils that have no overwash. It benefits from an artificial drainage system if adequate outlets are available. When installed, subsurface drains work fairly well if adequate outlets are available. If the soil is not subject to further siltation, row crops can be grown quite well. Because of flooding, a good stand of row crops can be difficult to establish in some years. Plowing and seedbed preparation is easier on this soil than on Colo soils without overwash because the surface layer is silt loam. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and maintian good tilth. This soil usually does not need lime.

If this soil is used for pasture, grazing should be restricted during wet periods. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good conditon.

This soil is in capability subclass IIw.

142—Chaseburg silt loam, 0 to 2 percent slopes. This nearly level, moderately well drained soil is on alluvial flood plains and lower ends of dissected uplands. This soil is subject to frequent flooding. Individual areas are long and irregular in shape. Individual areas of these map units often extend to a mile or more in length and are usually 100 acres or more in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 7 inches thick. To a depth of about 60 inches, the substratum is stratified dark grayish brown, brown, and grayish brown silt loam that is friable. In some areas these materials overlie a buried soil of black silt loam, which is 20 to 40 inches beneath the surface.

This soil has moderate permeability. Surface runoff is medium. The available water capacity is very high. A seasonal high water table is at a depth of 3 to 6 feet. Generally, this soil has good tilth. The substratum generally is low in available phosphorus and very low in available potassium. The surface layer is about 2 to 3 percent organic matter.

Most areas of this soil are in hay, pasture, or cultivated crops. The soil has good potential for hay, pasture, and cultivated crops. It has fair potential for trees.

This soil is well suited to corn, soybeans, and small grain if it is protected from flooding or is not subject to flooding in a given year. It is also well suited to grasses for hay and pasture. Some areas are subject to sedimentation. This soil is subject to flooding during periods of heavy rain, and crop damage results in some years. Flooding creates a period of extended wetness on this soil and delays tillage. The soil tends to puddle if worked when wet. Returning crop residue to the surface or the regular additon of other organic material into the plow layer helps improve fertility and maintain good tilth. The soil usually does not need lime.

If this soil is used for pasture or hay, overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is well suited to trees. Tree seeds, cuttings, and seedlings survive and grow if competing vegetation is controlled or removed. This can be accomplished by site preparation; by prescribed burning; or by spraying, cutting, or girdling.

This soil is in capability subclass IIw.

142B—Chaseburg silt loam, 2 to 5 percent slopes. This gently sloping, moderately well drained soil is in drainageways of uplands. Individual areas are long, narrow, and irregular in shape. These areas often extend to one-half mile or more in length and are usually 50 acres or more in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 7 inches thick. To a depth of about 60 inches, the substratum is stratified, dark grayish brown, brown, and grayish brown silt loam that is friable. In some areas these materials overlie a buried soil of black silt loam, which is 20 to 40 inches beneath the surface.

This soil has moderate permeability. Surface runoff is medium. The available water capacity is very high. A seasonal high water table is at a depth of 3 to 6 feet. Generally, this soil has good tilth. The substratum generally is low in available phosphorus and very low in available potassium. The surface layer is about 2 to 3 percent organic matter.

Many areas of this soil are in pasture; some are left idle or kept in grassed waterways. Small and narrow areas of cultivated soils are farmed with adjoining soils. This soil has fair potential for cultivated crops but good potential for hay and pasture. It has fair potential for trees and poor potential for most engineering uses.

This soil is suited to row crops, but it is better suited to grasses for hay and pasture. It is subject to high velocity, short-duration flooding. Seepage from the upland soils makes this soil seasonally wet. The soil puddles if

worked when wet. Soil erosion from the uplands creates siltation in some areas. In some places these soils are dissected by gullies or drainageways that connot be crossed. This hampers tillage. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and maintain good tilth. This soil usually does not need lime.

If this soil is used for pasture or hay, overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is well suited to trees. Tree seeds, cuttings, and seedlings survive and grow if competing vegetation is controlled or removed. This can be accomplished by site preparation; by prescribed burning; or by spraying, cutting, or girdling.

This soil is capability subclass IIe.

143—Brady sandy loam, 1 to 3 percent slopes. This very gently sloping, somewhat poorly drained soil is on concave foot slopes below uplands and on benches along streams. Individual areas are irregular in shape and are usually 5 to 10 acres in size.

Typically, the surface layer is very dark brown, very friable sandy loam. It is a plow layer about 8 inches thick. The subsurface layer is dark grayish brown, very friable sandy loam about 4 inches thick. The subsoil is about 23 inches thick. The upper part is brown, very friable sandy loam. The middle part is strong brown and grayish brown, friable sandy loam. The lower part is light brownish gray, very friable loamy sand with strong brown mottles. To a depth of about 60 inches, the substratum is stratified light brownish gray, light gray and dark yellowish brown, loose sand and coarse sand with strong brown mottles.

Included with this soil in mapping are small areas of Granby and Udolpho soils. The Granby soils are in slight depressions, which tend to pond during wet seasons. Field operations can be delayed. The Udolpho soils, which are scattered throughout the unit, are higher in clay content, less droughty, and more productive than this Brady soil. These areas make up less than 5 percent of the unit.

This soil has moderately rapid permeability in the subsoil and very rapid permeability in the substratum. Surface runoff is slow. The available water capacity is low. A seasonal high water is at a depth of 1 foot to 3 feet. The subsoil is generally very low in available phosphorus and potassium. The surface layer is about 1 1/2 to 2 1/2 percent organic matter.

Most areas of this soil are in cultivated crops, hay, and pasture. The soil has fair potential for cultivated crops, hay, pasture, and trees. It has poor potential for most engineering uses.

This soil is suited to corn, soybeans, and small grains and to grasses for hay and pasture. If this soil is used for cultivated crops, it is subject to wind erosion. Conservation practices that leave crop residue on the surface help reduce soil blowing. In the spring this soil has a seasonally high water table, which drops rapidly during the growing season. During wet seasons this soil benefits from subsurface drains. Subsurface drains are difficult to install and maintain because of the underlying, loose sand. Later in the growing season this soil is droughty. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve soil fertiltiy. The need for lime in the surface layer varies according to liming practices performed in previous years. Generally, this soil needs lime if it has not been applied in the past 3 to 5 years.

The use of this soil for pasture or hay is an effective way of controlling erosion. Overgrazing or grazing when the soil is wet, however, causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet and very dry periods help keep the pasture and soil in good condition.

This soil is moderately well suited to trees; however, few areas of this soil are in timber. Tree seeds, cuttings, and seedlings survive and grow when precipitation is normal. Competing vegetation should be controlled or removed by site preparation; by prescribed burning; or by spraying, cutting, or girdling.

This soil is in capability subclass IIw.

152—Marshan clay loam, 32 to 40 inches to sand and gravel, 0 to 2 percent slopes. This nearly level, poorly drained soil is on benches along streams and in drainageways that are filled with erosional outwash sediments. This soil is subject to occasional flooding. Individual areas are long and irregular in shape and are usually 50 to 200 acres in size.

Typically, the surface layer is black, friable clay loam about 8 inches thick. The subsurface layer is black, friable clay loam about 9 inches thick. The subsoil is about 21 inches thick. The upper part is dark gray, friable loam with olive gray, light olive gray, and strong brown mottles. The middle part is olive gray, friable loam mottled with dark gray and yellowish brown. The lower part is olive gray, friable loam with yellowish brown mottles. To a depth of about 60 inches, the substratum is light olive gray, very friable coarse sand with yellowish brown mottles. In some places the coarse material is as deep as 48 inches.

Included with this soil in mapping are a few small areas of somewhat poorly drained Udolpho and Lawler soils. The Lawler soils are on slightly higher positions of the landscape. They are not subject to runoff from the uplands as are the Marshan soils. The Udolpho soils in addition to being on slightly higher positions have less organic matter and are not as productive as this Marshan soil. These areas make up 5 to 10 percent of the unit.

This soil has moderate permeability in the loamy material and rapid permeability in the underlying sand

and gravel. Surface runoff is slow. The available water capacity is high. A seasonal high water table is at a depth of 1 foot to 2 feet. This soil has fair tilth. The subsoil is very low in available phosphorus and potassium. The surface layer is about 5 to 6 percent organic matter.

Most areas of this soil are in cultivated crops. The soil has good potential for cultivated crops, hay, and pasture. It has poor potential for most engineering uses.

This soil is well suited to corn, soybeans, and small grains and to grasses for hay and pasture. This soil tends to puddle if worked when wet. Artificial drainage is needed for row crop production to lower the water table and to improve the timeliness of field operations. Adequate outlets for drains are difficult to establish in some places. Subsurface drains can be difficult to install and maintain because of the loose, water-bearing sands and gravel at a depth of 3 feet. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and maintain soil tilth. Liming is seldon needed on this soil.

Areas of this soil that are not adequately drained are generally used for pasture. Overgrazing or grazing when the soil is too wet, however, causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is in capability subclass IIw.

159—Finchford loamy sand, 0 to 2 percent slopes. This nearly level, excessively drained soil is on benches along the major rivers in the county. This soil is flooded when stream levels are much higher than normal. Individual areas are broad and irregular in shape and are usually 10 to 100 acres in size. A few areas are very extensive and are several hundred acres in size.

Typically, the surface layer is very dark grayish brown, very friable loamy sand about 7 inches thick. The subsurface layer is very dark grayish brown, very friable loamy sand about 11 inches thick. The subsoil is about 13 inches thick. It is dark brown, very friable loamy sand. The substratum is brown, loose coarse sand to a depth of about 60 inches. In some areas the surface layer is sandy loam.

Included with this soil in mapping, within the cities of Clinton and Camanche, is a significant amount of heavily urbanized land. These areas have been greatly modified by the building of houses, factories, streets, and various underground pipe and cable installations. Because the land has been so modified, some soil properties characteristic to the Finchford soils are somewhat altered. Also included are areas within the Wapsipinicon River flood plain that are subject to frequent flooding. Crops are difficult to establish during the spring. Included areas make up less than 5 percent of the map unit.

This soil has very rapid permeability. Surface runoff is slow. The available water capacity is very low. As this soil dries out, traction of farm machinery can become difficult because the consistence is very friable to loose. This soil is typically medium acid in the surface layer. The subsoil is generally very low in available phosphorus and potassium. The surface layer is about 1 to 1 1/2 percent organic matter.

Most areas of this soil are in pasture, hay, and cultivated crops. The soil has poor potential for cultivated crops but has fair potential for hay and pasture. It has fair potential for most engineering uses, but there is a pollution hazard when the soil is used for onsite sewage treatment.

This soil is poorly suited to corn, soybeans, and small grains. It is better suited to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, it is subject to wind erosion. This soil is very droughty unless rainfall is above normal and timely. Conservation practices that leave crop residue on the surface help reduce soil blowing and conserve moisture. Returning crop residue to the surface or the regular addition of other organic material into the plow layer also helps improve soil fertility. The need for lime varies in the surface layer according to previous liming practices. Because of the acidity, this soil needs lime if it has not been applied in the past 3 to 5 years.

The use of this soil for pasture or hay is an effective way of controlling wind erosion. Proper stocking rates; pasture rotation; and timely deferment of grazing, especially during dry periods, help keep the pasture and soil in good condition.

This soil is in capability subclass IVs.

159C—Finchford loamy sand, 2 to 9 percent slopes. This gently sloping to moderately sloping, excessively drained soil is on bench escarpments along the Wapsipinicon and Mississippi Rivers. Individual areas are long and irregular in shape and are usually 10 to 50 acres in size.

Typically, the surface layer is very dark grayish brown, very friable loamy sand about 7 inches thick. The subsurface layer is very dark grayish brown, friable loamy sand about 8 inches thick. The subsoil is about 13 inches thick. It is dark brown, very friable loamy sand. The substratum is brown, loose sand and gravelly sand to a depth of about 60 inches. In some areas the surface layer is sandy loam.

This soil has very rapid permeability. Surface runoff is slow. The available water capacity is very low. Reaction is typically medium acid in the surface layer. The subsoil is generally very low in available phosphorus and potassium. The surface layer is about 1 to 1 1/2 percent organic matter.

Most areas of this soil are in pasture, hay, and cultivated crops. The soil has poor potential for cultivated crops but has fair potential for hay, pasture, and trees. It has fair potential for most engineering uses, but there is a pollution hazard when the soil is used for onsite sewage treatment.

This soil is poorly suited to corn, soybeans, and small grains. It is better suited to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, it is subject to wind and water erosion. This soil is very droughty unless rainfall is above normal and timely. As this soil dries, traction of farm machinery becomes difficult because consistence is very friable to loose. Conservation practices that leave crop residue on the surface help reduce soil erosion and conserve moisture. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve soil fertility. The need for lime in the surface layer varies according to previous liming practices. Generally, the soil needs lime if it has not been applied in the past 3 to 5 years.

The use of this soil for pasture or hay is an effective way of controlling erosion. Proper stocking rates; pasture rotation; and timely deferment of grazing; especially during dry periods, help keep the pasture and soil in good condition.

This soil is in capability subclass IVs.

160—Walford silt loam, 0 to 1 percent slopes. This level, poorly drained soil is in depressional areas near heads of drainageways. These soils are in uplands. Individual areas are oval and rounded in shape and are usually small in size. This soil is also on loess-covered benches, north of Goose Lake, along Deep Creek. These areas are broad and irregular in shape and are several hundred acres in size.

Typically, the surface layer is very dark gray, friable silt loam about 9 inches thick. The subsurface layer is grayish brown, friable silt loam about 10 inches thick. The subsoil is 35 inches thick. The upper part is grayish brown, friable silty clay loam mottled with olive brown and yellowish brown. The lower part is grayish brown and light olive gray, friable silty clay loam with brown and strong brown mottles. To a depth of about 60 inches, the substratum is light olive gray, friable silt loam with yellowish brown mottles. Coarse sand is at a depth of 15 to 20 feet in the area north of Goose Lake and along Deep Creek.

This soil has slow permeability. Surface runoff is slow, and water ponds in some areas. The available water capacity is high. A seasonal high water table is at a depth of 0 to 2 feet. This soil has good tilth. Generally, it is acid in the surface layer. The subsoil is low in available phosphorus and very low in available potassium. The surface layer is about 2 1/2 to 3 1/2 percent organic matter.

Most areas of this soil are in cultivated crops. The soil has fair potential for cultivated crops, hay, pasture, and trees. It has poor potential for most engineering uses.

This soil is suited to corn, soybeans, and small grains and to grasses for hay and pasture. This soil is suited to intensive use for row crops if adequately drained. It has a high water table, and in some areas water ponds for short periods. The soil tends to puddle if worked when wet. Crops are drowned out in some years (fig. 8). Subsurface drains or open ditches are needed to successfully lower the water table and reduce ponding. Areas of this soil that are not adequately drained are generally used for pasture or left idle. In some areas, plowing this soil mixes part of the subsurface layer into the plow layer, which causes crusting after hard rains. Seedling development is retarded if crusting occurs prior to emergence. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and tilth of the soil. Because of the acidity, this soil needs lime if it has not been applied in the past 3 to 4 years.

If this soil is used for pasture, grazing should be restricted during wet periods. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help keep pasture and soil in good condition.

This soil is in capability subclass IIIw.

162B—Downs silt loam, 2 to 5 percent slopes. This gently sloping, well drained soil is in uplands. It is on convex ridges and side slopes. Individual areas are broad and irregular in shape and are usually 40 to 100 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 8 inches thick. The subsurface layer is brown, friable silt loam about 4 inches thick. The subsoil is 42 inches thick. The upper part is brown, friable silty clay loam. The middle part is dark yellowish brown, friable silty clay loam. The lower part is yellowish brown, friable silty clay loam. To a depth of about 60 inches, the substratum is yellowish brown, friable silt loam mottled with grayish brown.

This soil has moderate permeability. Surface runoff is medium. The available water capacity is high. This soil has good tilth. Generally, this soil is acid in the surface layer. The subsoil is medium in available phosphorus and very low in available potassium. The surface layer is about 2 to 3 percent organic matter.

Most areas of this soil are in cultivated crops. The soil has good potential for cultivated crops, hay, pasture, and trees. It has good potential for most engineering uses.

This soil is well suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. This soil is suited to intensive row crops if it is well managed. It tends to puddle if worked when wet, and it is subject to erosion. Contour stripcropping or other conservation practices that leave crop residue on the surface reduce soil loss. Many areas have slopes long and smooth enough to be terraced and farmed on the contour. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and maintain good tilth. Because of the acidity, this soil needs lime if it has not been applied in the past 3 to 4 years.

The use of this soil for pasture or hay is effective in

controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, increased runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is well suited to trees. Tree seeds, cuttings, and seedlings survive and grow well if competing vegetation is controlled or removed. This can be accomplished by site preparation; by prescribed burning; or by spraying, cutting, or girdling.

This soil is in capability subclass IIe.

162C—Downs silt loam, 5 to 9 percent slopes. This moderately sloping, well drained soil is in uplands. It is on convex, narrow ridgetops and side slopes. Individual areas are irregular in shape and are usually 10 to 50 acres in size.

Typically, the surface layer is very dark grayish brown and dark brown, friable silt loam. It is a plow layer about 9 inches thick. The subsoil is about 42 inches thick. The upper part is brown, friable silty clay loam. The middle part is dark yellowish brown, friable silty clay loam. The lower part is yellowish brown, friable silty clay loam. To a depth of about 60 inches, the substratum is yellowish brown, friable silt loam with grayish brown mottles.

This soil has moderate permeability. Surface runoff is medium. The available water capacity is high. This soil has good tilth. Generally, this soil is acid in the surface layer. The subsoil is medium in available phosphorus and very low in available potassium. The surface layer is about 2 to 3 percent organic matter.

Most areas of this soil have a cropping system of cultivated crops in rotation with hay. The soil has good potential for cultivated crops, hay, pasture, and trees. It has fair potential for most engineering uses.

This soil is well suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture.

Figure 8.—Water ponds on Walford soils during wet spring seasons or after heavy rains. Growth of crops, such as corn in foreground, will be retarded by the extreme wetness.

If this soil is used for cultivated crops, it is subject to erosion. It tends to puddle if worked when wet. Contour stripcropping and conservation practices that leave crop residue on the surface reduce soil loss. Many areas have slopes long and smooth enough to be terraced and farmed on the contour. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and maintain good tilth. Because of the acidity, this soil needs lime if it has not been applied in the past 3 or 4 years.

The use of this soil for pasture or hay is effective in controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, increased runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is well suited to trees. Tree seeds, cuttings, and seedlings survive and grow well if competing vegetation is controlled or removed. This can be accomplished by site preparation; by prescribed burning; or by spraying, cutting, or girdling.

This soil is in capability subclass IIIe.

162C2—Downs silt loam, 5 to 9 percent slopes, moderately eroded. This moderately sloping, well drained soil is in uplands. It is on convex, narrow ridgetops and on side slopes. Individual areas are irregular in shape and are usually 10 to 100 acres in size.

Typically, the surface layer is about 7 inches of very dark grayish brown and dark brown, friable silt loam mixed with brown, friable silty clay loam material from the subsoil. The subsoil is about 40 inches thick. The upper part is brown, friable silty clay loam. The middle part is dark yellowish brown, friable silty clay loam. The lower part is yellowish brown, friable silty clay loam. To a depth of about 60 inches, the substratum is yellowish brown, friable silty loam mottled with grayish brown.

This soil has moderate permeability. Surface runoff is medium. The available water capacity is high. This soil has fair tilth. Generally, this soil is acid in the surface layer. The subsoil is medium in available phosphorus and very low in available potassium. The surface layer is about 1 to 2 percent organic matter. This soil has more runoff and less infiltration of water than the uneroded Downs soils.

Most areas of this soil have a cropping system of cultivated crops in rotation with hay. The soil has good potential for cultivated crops, hay, pasture, and trees. It has fair potential for most engineering uses.

This soil is well suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, it is subject to further erosion. It tends to puddle if worked when wet and crusts after hard rains. Seedling development is retarded if the crusting occurs prior to emergence. Contour stripcropping or conservation practices that leave crop residue on the surface reduce soil loss. Many areas have slopes long and smooth enough to be terraced and farmed on the contour. This soil needs more fertilization than the uneroded Downs soils to obtain the same yields. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility, increase infiltration of water, and maintain soil tilth. Because of the acidity, this soil needs lime if it has not been applied in the past 3 or 4 years.

The use of this soil for pasture or hay is effective in controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, increased runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is well suited to trees. Tree seeds, cuttings, and seedlings survive and grow if competing vegetation is controlled or removed. This can be accomplished by site preparation; by prescribed burning; or by spraying, cutting, or girdling.

This soil is in capability subclass IIIe.

162D—Downs silt loam, 9 to 14 percent slopes. This strongly sloping, well drained soil is in uplands. It is on convex side slopes. Individual areas are irregular in shape and are usually 20 to 50 acres in size.

Typically, the surface layer is very dark grayish brown and dark brown, friable silt loam. It is a plow layer about 8 inches thick. The subsoil is about 40 inches thick. The upper part is brown, friable silty clay loam. The middle part is dark yellowish brown, friable silty clay loam. The lower part is yellowish brown, friable silty clay loam. To a depth of about 60 inches, the substratum is yellowish brown, friable silt loam mottled with grayish brown.

Included with this soil in mapping are a few small areas of Gara soils. These soils are on the lower part of convex side slopes and are lower in fertility than this Downs soil. Gara soils formed in glacial till material, which can be seepy during wet seasons. These areas make up less than 5 percent of the unit.

This soil has moderate permeability. Surface runoff is rapid. The available water capacity is high. This soil has good tilth. Generally, this soil is acid in the surface layer. The subsoil is medium in available phosphorus and very low in available potassium. The surface layer is about 2 to 3 percent organic matter.

Most areas of this soil have a cropping system of cultivated crops in rotation with hay. This soil has fair potential for cultivated crops but good potential for hay, pasture, and trees. It has fair potential for most engineering uses.

This soil is suited to corn and small grains, but it is better suited to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, it is subject to erosion. It tends to puddle if worked when wet. Contour stripcropping or conservation practices that

leave crop residue on the surface reduce soil loss. Many areas have slopes long and smooth enough to be terraced and farmed on the contour. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and maintain good tilth. Because of the acidity, this soil needs lime if it has not been applied in the past 3 to 4 years.

The use of this soil for pasture or hay is effective in controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, increased runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is well suited to trees. Tree seeds, cuttings, and seedlings survive and grow well if competing vegetation is controlled or removed. This can be accomplished by site preparation; by prescribed burning; or by spraying, cutting, or girdling.

This soil is in capability subclass IIIe.

162D2—Downs silt loam, 9 to 14 percent slopes, moderately eroded. This strongly sloping, well drained soil is in uplands. It is on convex side slopes. Individual areas are irregular in shape and are usually 25 to 75 acres in size.

Typically, the surface layer is about 7 inches of very dark grayish brown and dark brown, friable silt loam mixed with brown, friable silty clay loam material from the subsoil. The subsoil is about 38 inches thick. The upper part is brown, friable silty clay loam. The middle part is dark yellowish brown, friable silty clay loam. The lower part is yellowish brown, friable silty clay loam. To a depth of about 60 inches, the substratum is yellowish brown, friable silt loam mottled with grayish brown.

Included with this soil in mapping are a few small areas of Gara soils. These soils are on the lower part of convex side slopes and are lower in fertility than this Downs soil. Gara soils are formed in glacial till material, which can be seepy during wet seasons. These areas make up less than 5 percent of the unit.

This soil has moderate permeability. Surface runoff is rapid. The available water capacity is high. This soil has fair tilth. Generally, this soil is acid in the surface layer. The subsoil is medium in available phosphorus and very low in available potassium. The surface layer is about 1 to 2 percent organic matter. This soil has more runoff and less infiltration of water than the uneroded Downs soils.

Most areas of this soil have a cropping system of cultivated crops in rotation with hay. This soil has fair potential for cultivated crops and trees but good potential for hay or pasture. It has fair potential for most engineering uses.

This soil is suited to growing corn and small grains occasionally, but it is better suited to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, it is subject to further erosion. It puddles if worked when wet and crusts after hard rains. Seedling development is retarded if crusting occurs prior to emergence. Contour stripcropping or conservation practices that leave crop residue on the surface reduce soil loss. Many areas have slopes long and smooth enough to be terraced and farmed on the contour. This soil needs more fertilization than the uneroded Downs soils to obtain the same yields. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility, reduce crusting, and increase the infiltration of water. Because of the acidity, this soil needs lime if it has not been applied in the last 3 or 4 years.

The use of this soil for pasture or hay is effective in controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, increased runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is well suited to trees. Tree seeds, cuttings, and seedlings survive and grow if competing vegetation is controlled or removed. This can be accomplished by site preparation; by prescribed burning; or by spraying, cutting, or girdling.

This soil is in capability subclass IIIe.

162E2—Downs silt loam, 14 to 18 percent slopes, moderately eroded. This moderately steep, well drained soil is in uplands. It is on convex side slopes. Individual areas are irregular in shape and are usually 25 to 75 acres in size.

Typically, the surface layer is about 6 inches of very dark grayish brown and dark brown, friable silt loam mixed with brown, friable silty clay loam material from the subsoil. The subsoil is about 36 inches thick. The upper part is brown, friable silty clay loam. The middle part is dark yellowish brown, friable silty clay loam. The lower part is yellowish brown, friable silty clay loam. To a depth of about 60 inches, the substratum is yellowish brown, friable silt loam with grayish brown mottles.

Included with this soil in mapping are a few small areas of Gara soils. These soils are on the lower part of convex side slopes and are lower in fertility than this Downs soil. Gara soils formed in glacial till material, which can be seepy during wet seasons. Also included are a few small areas of soils where the thicker surface layer is higher in organic matter. These soils are scattered throughout the unit. These areas make up less than 10 percent of the unit.

This soil has moderate permeability. Surface runoff is medium. The available water capacity is high. This soil has fair tilth. Generally, this soil is acid in the surface layer. The subsoil is medium in available phosphorus and very low in available potassium. The surface layer is about 1/2 to 1 1/2 percent organic matter.

Most areas of this soil have a cropping system of cultivated crops in rotation with hay. Some areas are

also in pasture. This soil has fair potential for cultivated crops and trees, but it has good potential for hay or pasture. It has poor potential for most engineering uses.

This soil is suited to occasionally growing corn in rotation with small grain and to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, it is subject to further erosion. It puddles if worked when wet and crusts after hard rains. Seedling development is retarded if crusting occurs prior to emergence. Contour stripcropping or conservation practices that leave crop residue on the surface reduce soil loss. Most areas have slopes that are too steep and too short to be terraced; however, some areas can be terraced with the less sloping soil above. This soil requires more fertilization than the uneroded Downs soils to obtain the same yields. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility, reduce crusting, and increase the infiltration of water. Because of the acidity, this soil needs lime if it has not been applied in the past 3 or 4 years.

The use of this soil for pasture or hay is effective in controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, increased runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is well suited to trees. Tree seeds, cuttings, and seedlings survive and grow if competing vegetation is controlled or removed. This can be accomplished by site preparation; by prescribed burning; or by spraying, cutting, or girdling. There is a moderate hazard of erosion. A vegetative cover should be maintained. Special equipment might be needed because of the steep slopes.

This soil is in capability subclass IVe.

163B—Fayette silt loam, 2 to 5 percent slopes. This gently sloping, well drained soil is in uplands. It is on convex ridgetops. Individual areas are long and irregular in shape and are usually 50 to 75 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 4 inches thick. The subsurface layer is dark grayish brown, friable silt loam about 4 inches thick. The subsoil is about 48 inches thick. The upper part is yellowish brown, friable silt loam. The lower part is yellowish brown, friable silty clay loam. To a depth of about 60 inches, the substratum is yellowish brown, friable silt loam.

This soil has moderate permeability. Surface runoff is medium. The available water capacity is high. Generally, this soil has good tilth. This soil is typically acid in the surface layer. The subsoil is high in available phosphorus and very low in available potassium. The surface layer is about 1 to 2 percent organic matter.

Most areas of this soil have a cropping system of cultivated crops in rotation with hay; however, a few areas are in pasture or remain in timber. This soil has good potential for cultivated crops, hay, pasture, and trees. It is associated with steeper soils that have fair or poor potential for these uses. It has fair potential for most engineering uses.

This soil is well suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, it is subject to erosion. It puddles if worked when wet and crusts after hard rains. Seedling development is retarded if crusting occurs prior to emergence. Contour stripcropping and conservation practices that leave crop residue on the surface reduce soil loss. Many areas have slopes that are long and uniform enough to be terraced and farmed on the contour. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility, reduce crusting, and increase water infiltration. Because of the acidity, this soil needs lime if it has not been applied in the past 3 to 4 years.

The use of this soil for pasture or hay is effective in controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, increased runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is well suited to trees. Tree seeds, cuttings, and seedlings survive and grow if competing vegetation is controlled or removed. This can be accomplished by site preparation; by prescribed burning; or by spraying cutting or girdling.

This soil is in capability subclass IIe.

163C—Fayette silt loam, 5 to 9 percent slopes. This moderately sloping, well drained soil is on narrow, convex ridges and long side slopes. Individual areas are irregular in shape and are usually 30 to 40 acres in size.

Typically, the surface layer is a very dark grayish brown, friable silt loam about 4 inches thick. The subsurface layer is dark grayish brown, friable silt loam about 4 inches thick. The subsoil is about 48 inches thick. The upper part is yellowish brown, friable silt loam. The lower part is yellowish brown, friable silty clay loam. To a depth of about 60 inches, the substratum is yellowish brown, friable silt loam mottled with light brownish gray.

This soil has moderate permeability. Surface runoff is medium. The available water capacity is high. Generally, this soil has good tilth. This soil is typically acid in the surface layer. The subsoil is high in available phosphorus and very low in available potassium. The surface layer is about 1 to 2 percent organic matter.

Most areas of this soil have a cropping system of cultivated crops in rotation with hay; however, some are in pasture or remain in timber. This soil has good potential for cultivated crops, hay, pasture, and trees. It is associated with steeper soils that have fair or poor

potential for these uses. It has fair potential for most engineering uses.

This soil is suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, it is subject to erosion. It puddles if worked when wet and crusts after hard rains. Seedling development is retarded if crusting occurs prior to emergence. Contour stripcropping and conservation practices that leave crop residue on the surface reduce soil loss. Many areas have slopes that are long and uniform enough to be terraced and farmed on the contour. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility, reduce crusting, and increase water infiltration. Because of the acidity, this soil needs lime if it has not been applied in the past 3 or 4 years.

The use of this soil for pasture or hay is effective in controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, increased runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is well suited to trees. Some areas still remain in native hardwoods. These areas of native hardwoods can be kept in relatively productive timber crops by good management practices. Such practices include protection from livestock and fire, group selective cutting, and improved cutting practices.

This soil is capability subclass IIIe.

163C2—Fayette silt loam, 5 to 9 percent slopes, moderately eroded. This moderately sloping, well drained soil is on narrow, convex ridges and long side slopes. Individual areas are irregular in shape and are usually 40 to 60 acres in size.

Typically, the surface layer is about 7 inches of very dark grayish brown and dark grayish brown, friable silt loam mixed with yellowish brown, friable silt loam material from the subsoil. The subsoil is 46 inches thick. The upper part is yellowish brown, friable silt loam. The lower part is yellowish brown, friable silty clay loam. To a depth of about 60 inches, the substratum is yellowish brown, friable silt loam with light brownish gray mottles.

This soil has moderate permeability. Surface runoff is medium. The available water capacity is high. This soil has fair tilth. The soil is typically acid in the surface layer. The subsoil is high in available phosphorus and very low in available potassium. The surface layer is about 1/2 to 1 percent organic matter.

Most areas of this soil have a cropping system of cultivated crops in rotation with hay; however, some areas are in pasture. This soil has good potential for cultivated crops, hay, or pasture and fair potential for trees. It is associated with steeper soils that have poorer potential for these uses. It has fair potential for most engineering uses.

This soil is suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, it is subject to further erosion. It puddles if worked when wet and crusts after hard rains. Seedling development is retarded if crusting occurs prior to emergence. Contour stripcropping and conservation practices that leave crop residue on the surface reduce soil loss. Many areas have slopes that are long and uniform enough to be terraced and farmed on the contour. This soil requires more fertilization than the uneroded Fayette soils to obtain the same yields. This soil has more runoff and less infiltration of water than the uneroded Fayette soils. Returning crop residue to the surface or the regular addition of other organic material helps improve fertility, reduce crusting, and increase water infiltration. Because of the acidity, this soil needs lime if it has not been applied in the past 3 or 4 years.

The use of this soil for pasture or hay is effective in controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, increased runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is well suited to trees. Tree seeds, cuttings, and seedlings survive and grow if competing vegetation is removed. This can be accomplished by site preparation; by prescribed burning; or by spraying, cutting, or girdling.

This soil is in capability subclass IIIe.

163D2—Fayette silt loam, 9 to 14 percent slopes, moderately eroded. This strongly sloping, well drained soil is on narrow, convex ridges and long, convex side slopes. Individual areas are irregular in shape and are usually 60 to 80 acres in size.

Typically, the surface layer is about 7 inches of very dark grayish brown and dark grayish brown, friable silt loam mixed with yellowish brown, friable silt loam material from the subsoil. The subsoil is about 44 inches thick. The upper part is yellowish brown, friable silt loam. The lower part is friable silty clay loam. To a depth of about 60 inches, the substratum is yellowish brown, friable silt loam mottled with light brownish gray.

Included with this soil in mapping are small areas of Lindley soils, which are on the lower part of side slopes. The Lindley soils formed in glacial till. They are seepy during wet seasons and low in fertility. These areas make up less than 5 percent of the unit.

This soil has moderate permeability. Surface runoff is rapid. The available water capacity is high. This soil has fair tilth. This soil is typically acid in the surface layer. The subsoil is high in available phosphorus and very low in available potassium. The surface layer is about 1/2 to 1 percent organic matter.

Most areas of this soil have a cropping system of cultivated crops in rotation with hay. A few areas are in

pasture. This soil has fair potential for cultivated crops and trees. It has good potential for hay or pasture. It has fair potential for most engineering uses.

This soil is suited to growing corn occasionally in rotation with small grains and to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, it is subject to further erosion. It puddles if worked when wet and crusts after rains. Seedling development is retarded if crusting occurs prior to emergence. Contour stripcropping and conservation practices that leave crop residue on the surface reduce soil loss. Many areas have slopes that are long and uniform enough to be terraced and farmed on the contour. This soil requires more fertilization than the uneroded Fayette soils to obtain the same yields. This soil has more runoff and less infiltration of water than the uneroded Fayette soil. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility, reduce crusting, and increase water infiltration. Because of the acidity, this soil needs lime if it has not been applied in the past 3 or 4 years.

The use of this soil for pasture or hay is effective in controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is well suited to trees. Tree seeds, cuttings, and seedlings survive and grow if competing vegetation is controlled or removed. This can be accomplished by site preparation; by prescribed burning; or by spraying, cutting, or girdling.

This soil is in capability subclass IIIe.

163D3—Fayette silty clay loam, 9 to 14 percent slopes, severely eroded. This strongly sloping, well drained soil is on narrow, convex ridges and long, convex side slopes. Individual areas are irregular in shape and are usually 60 to 80 acres in size.

Typically, the surface layer is about 7 inches of dark grayish brown, friable silty clay loam mixed with yellowish brown, friable silty clay loam material from the subsoil. The subsoil is about 42 inches thick. It is yellowish brown, friable silty clay loam. To a depth of about 60 inches, the substratum is yellowish brown, friable silt loam mottled with light brownish gray.

Included in mapping are small areas of Lindley soils, which are on lower side slopes. The Lindley soils, formed in glacial till, are seepy during wet seasons and low in fertility. These areas make up less than 5 percent of the unit.

This soil has a moderate permeability. Surface runoff is rapid. The available water capacity is high. This soil has fair tilth. It is typically acid in the surface layer. The subsoil is high in available phosphorus and very low in available potassium. The surface layer is less than one-half percent organic matter.

Most areas of this soil have a cropping system of cultivated crops in rotation with hay. A few areas are in pasture. This soil has fair potential for cultivated crops. It has good potential for hay or pasture but poor potential for trees. It has fair potential for most engineering uses.

This soil is suited to occasionally growing corn in rotation with small grains. It is better suited to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, it is subject to further erosion. It puddles if worked when wet and crusts after hard rains. Seedling development is retarded if crusting occurs prior to emergence. Contour stripcropping and conservation practices that leave crop residue on the surface reduce soil loss. A few areas have slopes that are long and uniform enough to be terraced and farmed on the contour. This soil requires more fertilization than the less eroded Fayette soils to obtain the same yields. This soil has more runoff and less infiltration of water than the less eroded Fayette soils. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps to improve fertility, reduce crusting, and increase water infiltration. Because of the acidity, this soil needs lime if it has not been applied in the past 3 or 4 years.

The use of this soil for pasture or hay is effective in controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction and excessive runoff. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is well suited to trees although they are difficult to establish. Tree seeds, cuttings, and seedlings survive and grow on this severely eroded soil if competing vegetation is controlled or removed. This can be accomplished by site preparation; by prescribed burning; or by spraying, cutting, or girdling.

This soil is in capability subclass IVe.

163E2—Fayette silt loam, 14 to 18 percent slopes, moderately eroded. This moderately steep, well drained soil is on short, convex side slopes. Individual areas are irregular in shape and are usually 30 to 50 acres in size.

Typically, the surface layer is about 7 inches of very dark grayish brown and dark grayish brown, friable silt loam mixed with yellowish brown, friable silt loam material from the subsoil. The subsoil is about 40 inches thick. The upper part is yellowish brown, friable silt loam. The lower part is yellowish brown, friable silty clay loam. To a depth of about 60 inches, the substratum is yellowish brown, friable silt loam.

This soil has moderate permeability. Surface runoff is rapid. The available water capacity is high. This soil has fair tilth. This soil is typically acid in the surface layer. The subsoil is high in available phosphorus and very low in available potassium. The surface layer is about 1/2 to 1 percent organic matter.

Many areas of this soil are in a cropping system of cultivated crops in rotation with hay. A few areas are in

pasture. This soil has fair potential for cultivated crops and trees. It has good potential for hay or pasture. It has poor potential for most engineering uses.

This soil is suited to growing corn occasionally in rotation with small grains. It is better suited to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, it is subject to further erosion. It puddles if worked when wet and crusts after hard rains. Seedling development is retarded if crusting occurs prior to emergence. Contour stripcropping and conservation practices that leave crop residue on the surface reduce soil loss. This soil requires more fertilization than the uneroded Fayette soils to obtain the same yields. This soil has more runoff and less infiltration of water than the uneroded Fayette soils. Returning crop residue to the surface or the regular addition of other organic material into the subsoil helps improve fertility, reduce crusting, and increase water infiltration. Because of the acidity, this soil needs lime if it has not been applied in the past 3 or 4 years.

The use of this soil for pasture or hay is effective in controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is well suited to trees. Tree seeds, cuttings, and seedlings survive and grow if competing vegetation is controlled or removed. This can be accomplished by site preparation; by prescribed burning; or by spraying, cutting, or girdling. There is a moderate erosion hazard. A vegetative cover should be maintained. Special equipment might be needed because of steep slopes.

This soil is in capability subclass IVe.

163E3—Fayette silty clay loam, 14 to 18 percent slopes, severely eroded. This moderately steep, well drained soil is on short, convex side slopes. Individual areas are irregular in shape and are usually 30 to 40 acres in size.

Typically, the surface layer is about 7 inches of dark grayish brown, friable silty clay loam mixed with yellowish brown, friable silty clay loam material from the subsoil. The subsoil is 38 inches thick. It is yellowish brown, friable silty clay loam. To a depth of about 60 inches, the substratum is yellowish brown, friable silt loam with light brownish gray mottles.

Included with this soil in mapping are small areas of Lindley soils, which are on the lower part of side slopes. The Lindley soils, formed in glacial till, are seepy during wet seasons and low in fertility. These areas make up less than 5 percent of the unit.

This soil has moderate permeability. Surface runoff is rapid. The available water capacity is high. This soil has fair tilth. This soil is typically acid in the surface layer. The subsoil is high in available phosphorus and very low in available potassium. The surface layer is less than one-half percent organic matter.

Most areas of this soil have a cropping system of cultivated crops in rotation with hay. Some areas are being returned to permanent pasture. This soil has poor potential for cultivated crops and fair potential for hay, pasture, or trees. It has poor potential for most engineering uses.

This soil is poorly suited to cultivated crops. Crops that require tillage should be grown only to reestablish grasses and legumes for hay and pasture. If this soil is used for cultivated crops, it is subject to further erosion. It puddles if worked when wet and crusts after hard rains. Seedling development is retarded if crusting occurs prior to emergence. The soil requires more fertilization than the less eroded Fayette soils to obtain the same yeilds. This soil has more runoff and less infiltration of water than the less eroded Fayette soils. The regular addition of organic material helps to improve fertility, reduce crusting, and increase water infiltration. Because of the acidity, this soil needs lime if it has not been applied in the past 3 or 4 years.

The use of this soil for pasture or hay is effective in controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction and excessive runoff. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is well suited to trees, although they are difficult to establish. Tree seeds, cuttings, and seedlings survive and grow on this severely eroded soil if competing vegetation is controlled or removed. This can be accomplished by site preparation; by prescribed burning; or by spraying, cutting, or girdling. There is a severe erosion hazard. A vegetative cover should be maintained. Special equipment might be needed because of the steep slopes.

This soil is in capability subclass VIe.

163F2—Fayette silt loam, 18 to 25 percent slopes, moderately eroded. This steep, well drained soil is on short, convex side slopes. Individual areas are irregular in shape and are usually 10 to 20 acres in size.

Typically, the surface layer is about 7 inches of very dark grayish brown and dark grayish brown, friable silt loam mixed with yellowish brown, friable silty clay loam material from the subsoil. The subsoil is about 36 inches thick. The upper part is yellowish brown, friable light silty clay loam, The lower part is friable silty clay loam. To a depth of about 60 inches, the substratum is yellowish brown, friable silt loam with light brownish gray mottles.

Included with this soil in mapping are small areas of Lindley soils, which are scattered throughout the unit. The Lindley soils, formed in glacial till, are seepy during wet seasons and low in fertility. Also included are small areas of limestone outcrops on lower parts of side slopes. These areas make up less than 5 percent of the unit.

This soil has moderate permeability. Surface runoff is rapid. The available water capacity is high. This soil has

fair tilth. This soil is typically acid in the surface layer. The subsoil is high in available phosphorus and very low in available potassium. The surface layer is about 1/2 to 1 percent organic matter.

Many areas of this soil have a cropping system of cultivated crops in rotation with hay. Some areas are being returned to pasture. This soil has poor potential for cultivated crops and fair potential for hay, pasture, or trees. It has poor potential for most engineering uses.

This soil is poorly suited to cultivated crops but is better suited to hay or pasture. The operation of ordinary farm machinery is difficult on these soils because of the steepness of slope and the presence of gullies and drainageways. If this soil is used for cultivated crops, it is subject to further erosion. It puddles if worked when wet and crusts after hard rains. Seedling development is retarded if crusting occurs prior to emergence. Crops that require tillage should be grown only to reestablish grasses and legumes for hay and pasture. This soil has more runoff and less infiltration of water than the uneroded Fayette soils. It requires more fertilization than the uneroded Fayette soils to obtain the same yields. Because of the acidity, this soil needs lime if it has not been applied in the past 3 to 4 years.

The use of this soil for pasture is effective in controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction and excessive runoff. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is well suited to trees. Tree seeds, cuttings, and seedlings survive and grow if competing vegetation is controlled or removed. This can be accomplished by site preparation; by prescribed burning; or by spraying, cutting, or girdling. There is a moderate hazard of erosion. A vegetative cover should be maintained. Special equipment might be needed because of the steep slopes.

This soil is in capability subclass VIe.

163F3—Fayette silty clay loam, 18 to 25 percent slopes, severely eroded. This steep, well drained soil is on short, convex side slopes. Individual areas are irregular in shape and are usually 20 to 30 acres in size.

Typically, the surface layer is about 7 inches of dark grayish brown, friable silty clay loam mixed with yellowish brown, friable silty clay loam material from the subsoil. The subsoil is about 34 inches thick. It is yellowish brown, friable silty clay loam. To a depth of about 60 inches, the substratum is yellowish brown, friable silt loam with light brownish gray mottles.

Included with this soil in mapping are small areas of Lindley soils, which are scattered throughout the unit. The Lindley soils, formed in glacial till, are seepy during wet seasons and low in fertility. Also included are small areas of limestone outcrops on lower side slopes. These areas make up less than 5 percent of the unit.

This soil has moderate permeability. Surface runoff is rapid. The available water capacity is high. This soil has fair tilth. It is typically acid in the surface layer. The subsoil is high in available phosphorus and very low in available potassium. The surface layer is less than one-half percent organic matter.

Many areas of this soil have a cropping system of cultivated crops in rotation with hay. Some areas are being returned to pasture. This soil has poor potential for cultivated crops and trees and fair potential for hay or pasture. It has poor potential for most engineering uses.

This soil is poorly suited to cultivated crops. It is better suited to hay or pasture. The operation of ordinary farm machinery is difficult on these soils because of the steepness of slope and the presence of gullies and drainageways. If this soil is used for cultivated crops, it is subject to further erosion. It puddles if worked when wet and crusts after hard rains. Seedling development is retarded if crusting occurs prior to emergence. Crops that require tillage should be grown only to reestablish grasses and legumes for hay and pasture. This soil has more runoff and less infiltration of water than the less eroded Fayette soils. It requires greater fertilization than the less eroded Fayette soils. Because of the acidity, the soil needs lime if it has not been applied in the past 3 or 4 years.

The use of this soil for pasture is effective in controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction and excessive runoff. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is well suited to trees although they are difficult to establish. Tree seeds, cuttings, and seedlings survive and grow on this severely eroded soil if competing vegetation is controlled or removed. This can be accomplished by site preparation; by prescribed burning; or by spraying, cutting, or girdling. There is a severe hazard of erosion. A vegetative cover should be maintained. Special equipment might be needed because of the steep slopes.

This soil is in capability subclass VIe.

163G—Fayette silt loam, 25 to 40 percent slopes. This very steep, well drained soil is on short, convex side slopes. Individual areas are irregular in shape and are usually 10 to 20 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 3 inches thick. The subsurface layer is dark grayish brown, friable silt loam about 5 inches thick. The subsoil is about 44 inches thick. The upper part is yellowish brown, friable light silty clay loam, and the lower part is yellowish brown, friable silty clay loam. To a depth of about 60 inches, the substratum is yellowish brown, friable silt loam with light brownish gray mottles.

Included with this soil in mapping are small areas of Lindley soils, which are scattered throughout the unit.

The Lindley soils, formed in glacial till, are seepy during wet seasons, and are low in fertility. Also included are small areas of limestone outcrops on the lower part of side slopes. These areas make up less than 5 percent of the unit.

This soil has moderate permeability. Surface runoff is rapid. The available water capacity is high. If cultivated, this soil has good tilth. This soil is typically acid in the surface layer. The subsoil is high in available phosphorus and very low in available potassium. The surface layer is about 1 to 2 percent organic matter.

Most areas of this soil are in woodland. The soil has poor potential for cultivated crops, hay, and pasture. It has fair potential for trees. It has poor potential for most engineering uses.

This soil is not suited to cultivated crops or hay. Ordinary farm machinery cannot be used on this soil because of the steepness of slope.

This soil is poorly suited to pasture. Grazing must be limited. Because of the acidity, this soil needs lime if it has not been applied in the past 3 or 4 years. In the many areas where slopes are so steep that fertilizer and lime application is not possible, pasture yields are low.

This soil is well suited to trees, and most areas remain in native hardwoods. These areas can be kept in relatively productive timber crops by good management practices. Such practices include protection from livestock and fire, group selective cutting, and improved cutting practices. There is a moderate erosion hazard. A vegetative cover should be maintained.

This soil is in capability subclass VIIe.

163G3—Fayette silty clay loam, 25 to 40 percent slopes, severely eroded. This very steep, well drained soil is on short, convex side slopes. Individual areas are irregular in shape and are usually 5 to 10 acres in size.

Typically, the surface layer is about 6 inches of dark grayish brown, friable silty clay loam mixed with yellowish brown, friable silty clay loam material from the subsoil. The subsoil is about 32 inches thick. It is yellowish brown, friable silty clay loam. To a depth of about 60 inches, the substratum is yellowish brown, friable silty loam with light brownish gray mottles.

Included with this soil in mapping are small areas of Lindley soils, which are scattered throughout the unit. The Lindley soils, formed in glacial till, are seepy during wet seasons and low in fertility. Also included are small areas of limestone outcrops on lower side slopes. These areas make up less than 5 percent of the unit.

This soil has moderate permeability. Surface runoff is rapid. The available water capacity is high. When cultivated, this soil has fair tilth. This soil is typically acid in the surface layer. The subsoil is high in available phosphorus and very low in available potassium. The surface layer is less than one-half percent organic matter.

Primarily, most areas of this soil are in permanent pasture with some trees. This soil has poor potential for growing cultivated crops, hay, pasture, and trees, It has poor potential for most engineering uses.

This soil is not suited to cultivated crops or hay. Ordinary farm machinery cannot be used on this soil because of the steepness of slope. This soil has more runoff and less infiltration of water than the less eroded Fayette soils. If this soil is used for cultivation of any type, the remaining surface is difficult to stabilize because of the low infiltration rate and rapid runoff.

This soil is poorly suited to pasture. There is a greater need to limit grazing on this soil than on less eroded Fayette soils. Erosion has left this soil less productive, and it generally cannot yield as much forage as less eroded areas. Because of the acidity, this soil needs lime if it has not been applied in the past 3 or 4 years. In many areas where slopes are so steep that fertilizer and lime application is not possible, pasture yields are very low.

This soil is moderately well suited to trees. It is difficult to get tree seeds, cuttings, and seedlings to survive on this severely eroded soil. Special seedbed preparation and additional fertilizer is needed. A vegetative cover should be maintained to prevent further erosion. Special equipment might be needed because of the steep slopes.

This soil is in capability subclass VIIe.

175—Dickinson fine sandy loam, 0 to 2 percent slopes. This nearly level, somewhat excessively drained soil is in uplands and on benches along streams. Individual areas are oval in shape and are usually 3 to 10 acres in size.

Typically, the surface layer is very dark brown, very friable fine sandy loam about 7 inches thick. The subsurface layer is very dark brown and very dark grayish brown, very friable fine sandy loam about 12 inches thick. The subsoil is about 23 inches thick. The upper part is brown, very friable sandy loam. The lower part is brown, very friable loamy sand and yellowish brown, very friable sand. To a depth of about 60 inches, the substratum is yellowish brown, very friable sand and thin bands of brown, very friable sandy loam.

This soil has moderately rapid permeability in the upper part and rapid permeability in the lower part. Surface runoff is slow. The available water capacity is low. The subsoil is generally very low in available phosphorus and potassium. The surface layer is about 1 to 2 percent organic matter.

Most areas of this soil are in cultivated crops and hay. The soil has fair potential for cultivated crops, hay, and pasture. It has fair potential for most engineering uses, but there is a pollution hazard when the soil is used for onsite sewage treatment.

This soil is suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, it is subject to wind erosion. This soil is droughty, but production of crops is good if rainfall is normal and timely. Conservation

practices that leave crop residue on the surface help reduce soil erosion and conserve moisture. Returning crop residue to the surface or the regular addition of other organic material into the plow layer also helps improve soil fertility. The need for lime in the surface layer varies according to previous liming practices. Generally, the soil needs lime if it has not been applied in the past 3 to 5 years.

The use of this soil for pasture or hay is an effective way of controlling erosion. Proper stocking rates; pasture rotation; and timely deferment of grazing, especially during dry periods, help keep the pasture and soil in good condition.

This soil is in capability subclass IIs.

175B—Dickinson fine sandy loam, 2 to 5 percent slopes. This gently sloping, somewhat excessively drained soil is in uplands and on benches along streams. It is on convex ridges and side slopes. Individual areas are oblong and irregular in shape and are usually 5 to 15 acres in size.

Typically, the surface layer is very dark brown, very friable fine sandy loam about 7 inches thick. The subsurface layer is very dark brown and very dark grayish brown, very friable fine sandy loam about 12 inches thick. The subsoil is about 23 inches thick. The upper part is brown, very friable sandy loam. The lower part is brown and yellowish brown, very friable loamy sand and sand. To a depth of about 60 inches, the substratum is yellowish brown, very friable sand and thin bands of brown, very friable sandy loam. In a few areas the substratum contains gravelly sand.

Included with this soil in mapping are a few scattered areas of Dickinson soils, loam substratum. These soils have glacial till of friable loam at a depth of about 4 feet. During wet seasons in spring and fall, water moves laterally along the surface of the less permeable till. This causes seeps on side slopes and delays field operations. These areas make up 5 to 10 percent of the unit.

This soil has moderately rapid permeability in the upper part and rapid permeability in the lower part. Surface runoff is medium. The available water capacity is low. The subsoil is generally very low in available phosphorus and potassium. The surface layer is about 1 to 2 percent organic matter.

Most areas of this soil are in cultivated crops and hay. This soil has fair potential for cultivated crops, hay, and pasture. It has fair potential for most engineering uses, but there is a pollution hazard if this soil is used for onsite sewage treatment.

This soil is suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, it is subject to wind and water erosion. This soil is droughty, but production of crops is good if rainfall is normal and timely. Conservation practices that leave crop residue on the surface help reduce soil erosion and conserve moisture. In addition stripcropping helps reduce soil erosion. Returning crop residue to the surface or the regular addition of other organic material into the plow layer improves soil fertility. The need for lime in the surface layer varies according to previous liming practices. Generally, this soil needs lime if it has not been applied in the past 3 to 5 years.

The use of this soil for pasture or hay is an effective way of controlling erosion. Proper stocking rates; pasture rotation; and timely deferment of grazing, especially during dry periods, help keep the pasture and soil in good condition.

This soil is in capability subclass IIe.

175C—Dickinson fine sandy loam, 5 to 9 percent slopes. This moderately sloping, somewhat excessively drained soil is in uplands and on benches along streams. It is on convex ridges and side slopes. Individual areas are irregular in shape and are usually 5 to 20 acres in size.

Typically, the surface layer is very dark brown, very friable fine sandy loam about 7 inches thick. The subsurface layer is very dark brown and very dark grayish brown, very friable fine sandy loam about 7 inches thick. The subsoil is about 23 inches thick. The upper part is brown, very friable sandy loam. The lower part is brown, very friable loamy sand and yellowish brown, very friable sand. To a depth of about 60 inches, the substratum is yellowish brown, very friable sand and thin bands of brown, very friable sandy loam. In a few areas the substratum contains gravelly sand.

Included with this soil in mapping are a few scattered areas of Dickinson soils, loam substratum. These soils have glacial till of friable loam at a depth of about 4 feet. During wet seasons in spring and fall, water moves laterally along the surface of the less permeable till. This causes seeps on hillsides, which delay field operations. These areas make up less than 5 percent of the unit.

This soil has moderately rapid permeability in the upper part and rapid permeability in the lower part. Surface runoff is medium. The available water capacity is low. The subsoil is generally very low in available phosphorus and potassium. The surface layer is about 1 to 2 percent organic matter.

Most areas of this soil are in cultivated crops and hay. This soil has poor potential for cultivated crops but fair potential for hay and pasture. It has fair potential for most engineering uses, but there is a pollution hazard where this soil is used for onsite sewage treatment.

This soil is poorly suited to corn, soybeans, and small grains. It is better suited to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, it is subject to wind and water erosion. This soil is droughty, and production of all crops is dependent on the amount and timeliness of rainfall. Conservation practices that leave crop residue on the surface help reduce soil erosion and conserve moisture. In addition, stripcropping helps reduce soil erosion. Returning crop residue to the surface or the regular addition of other organic material

into the plow layer helps improve soil fertility. The need for lime in the surface varies according to previous liming practices. Generally, this soil needs lime if it has not been applied in the past 3 to 5 years.

The use of this soil for pasture or hay is an effective way of controlling erosion. Proper stocking rates; pasture rotation; and timely deferment of grazing, especially during dry periods, help keep the pasture and soil in good condition.

This soil is in capability subclass IIIe.

175D—Dickinson fine sandy loam, 9 to 18 percent slopes. This strongly sloping and moderately steep, somewhat excessively drained soil is in uplands. It is on convex side slopes and ridges. Individual areas are irregular in shape and are usually 10 to 30 acres in size.

Typically, the surface layer is very dark brown and very dark grayish brown, very friable sandy loam about 8 inches thick. The subsoil is about 21 inches thick. The upper part is brown, very friable sandy loam. The lower part is brown, very friable loamy sand and yellowish brown, very friable sand. To a depth of about 60 inches, the substratum is yellowish brown, very friable sand and thin bands of brown, very friable sandy loam. In some areas the surface layer is less than 7 inches thick.

Included with this soil in mapping are scattered areas of Sparta and Tama soils. The Sparta soils contain less clay and are more droughty than this Dickinson soil. The Tama soils contain more clay, are less droughty, and are more productive. These areas make up 15 to 20 percent of the unit.

This soil has moderately rapid permeability in the upper part and rapid permeability in the lower part. Surface runoff is medium. The available water capacity is low. The subsoil is generally very low in available phosphorus and potassium. The surface layer is 1 to 2 percent organic matter.

Most areas of this soil are in cultivated crops, hay, or pasture. This soil has poor potential for cultivated crops but has fair potential for hay and pasture. It has poor potential for most engineering uses, and there is a pollution hazard when this soil is used for onsite sewage treatment.

This soil is poorly suited to corn, soybeans, and small grains. It is better suited to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, it is subject to wind and water erosion. This soil is droughty, and production of all crops is dependent on the amount and timeliness of rainfall. Conservation practices that leave crop residue on the surface help reduce soil erosion and conserve moisture. In addition, stripcropping helps reduce soil erosion. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve soil fertility. The need for lime on the surface layer varies according to previous liming practices. Generally, this soil needs lime if it has not been applied in the past 3 to 5 years.

The use of this soil for pasture or hay is an effective way of controlling erosion. Proper stocking rates; pasture rotation; and timely deferment of grazing, especially during dry periods, help keep the pasture and soil in good condition.

This soil is in capability subclass IVe.

177—Saude loam, 0 to 2 percent slopes. This nearly level, well drained soil is on stream benches and on outwash plains of uplands. Individual areas are irregular in shape and are usually 10 to 30 acres in size.

Typically, the surface layer is very dark brown, friable loam about 8 inches thick. The subsurface layer is very dark grayish brown, friable loam about 10 inches thick. The subsoil is about 12 inches thick. The upper part is brown, friable loam. The lower part is dark yellowish brown, very friable sandy loam. To a depth of about 60 inches, the substratum is yellowish brown, loose fine and medium sand and about 2 to 5 percent fine gravel.

This soil has moderate permeability in the loamy material and very rapid permeability in the underlying coarse sand and gravel. Surface runoff is slow. The available water capacity is moderate. This soil has good tilth. Generally, the surface layer is slightly acid. The subsoil is low in available phosphorus and very low in available potassium. The surface layer is about 2 to 3 percent organic matter.

Most areas of this soil are in cultivated crops and hay. The soil has fair potential for cultivated crops, hay, pasture, and trees. It has fair potential for most engineering uses, but there is a pollution hazard if the soil is used for onsite sewage treatment.

This soil is suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, it is subject to wind erosion. This soil is droughty, but production of crops is good if rainfall is normal and timely. It tends to puddle if worked when wet. Conservation practices that leave crop residue on the surface help reduce soil blowing and conserve moisture. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and increase the infiltration of water. The need for lime in the surface layer varies according to previous liming practices. Because of the acidity, this soil needs lime if it has not been applied in the past 3 or 4 years.

The use of this soil for pasture or hay is an effective way of controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet or very dry periods help keep the pasture and soil in good condition.

This soil is in capability subclass IIs.

177B—Saude loam, 2 to 5 percent slopes. This gently sloping, well drained soil is on benches along streams and on outwash plains of uplands. Slopes are convex. Individual areas are irregular in shape and are usually 10 to 50 acres in size.

Typically, the surface layer is very dark brown, friable loam about 8 inches thick. The subsurface layer is very dark grayish brown, friable loam about 10 inches thick. The subsoil is about 12 inches thick. The upper part is brown, friable loam. The lower part is dark yellowish brown, very friable sandy loam. To a depth of about 60 inches, the substratum is yellowish brown, loose fine and medium sand and about 2 to 5 percent fine gravel.

Included with this soil in mapping are small areas of Dickinson and Waukee soils. The Dickinson soils are on high positions of the landscape, are higher in sand content, and are more droughty than the Saude soil. The Waukee soils, in low swales, are deeper to coarser textures. These areas make up 5 to 10 percent of the unit.

This soil has moderate permeability in the upper part and very rapid permeability in the lower part. Surface runoff is slow. The available water capacity is moderate. This soil has good tilth. Generally, the surface layer is slightly acid. The subsoil is low in available phosphorus and very low in available potassium. The surface layer is about 2 to 3 percent organic matter.

Most areas of this soil are in cultivated crops and hay. This soil has fair potential for cultivated crops, hay, pasture, and trees. It has fair potential for most engineering uses, but there is a pollution hazard if the soil is used for onsite sewage treatment.

This soil is suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, it is subject to wind and water erosion. This soil is droughty, but production of crops is good if rainfall is normal and timely. It puddles if worked when wet. Conservation practices that leave crop residue on the surface help reduce soil erosion and conserve moisture. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and increase the infiltration of water. The need for lime in the surface layer varies according to previous liming practices. Because of the acidity, the soil needs lime if it has not been applied in the past 3 or 4 years.

The use of this soil for pasture or hay is an effective way of controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, increased runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet or very dry periods help keep the pasture and soil in good condition.

This soil is in capability subclass IIe.

177C—Saude loam, 5 to 9 percent slopes. This moderately sloping, well drained soil is on benches along streams and on outwash plains of uplands. It is on convex side slopes. Individual areas are long and irregular in shape and are usually 5 to 15 acres in size.

Typically, the surface layer is very dark brown, friable loam about 8 inches thick. The subsurface layer is very dark grayish brown, friable loam about 7 inches thick. The subsoil is about 12 inches thick. The upper part is brown, friable loam. The lower part is dark yellowish brown, very friable sandy loam. To a depth of about 60 inches, the substratum is yellowish brown, loose fine and medium sand and about 2 to 5 percent fine gravel.

This soil has moderate permeability in the upper part and very rapid permeability in the lower part. Surface runoff is slow. The available water capacity is moderate. This soil has good tilth. Generally, the surface layer is slightly acid. The subsoil is low in available phosphorus and very low in available potassium. The surface layer is about 2 to 3 percent organic matter.

Most areas of this soil are in cultivated crops and hay. This soil has poor potential for cultivated crops, hay, and pasture but has fair potential for trees. It has fair potential for most engineering uses, but there is a pollution hazard if the soil is used for onsite sewage treatment.

This soil is poorly suited to corn, soybeans, and small grains. It is better suited to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, it is subject to wind and water erosion. This soil is droughty, and production of all crops is dependent on amount and timeliness of rainfall. This soil puddles if worked when wet. Conservation practices that leave crop residue on the surface help reduce soil erosion and conserve moisture. Returning crop residue to the surface or the regular addition of other organic material into the plow layer also helps improve fertility and increase the infiltration of water. The need for lime in the surface layer varies according to previous liming practices. Because of the acidity, this soil needs lime if it has not been applied in the past 3 or 4 years.

The use of this soil for pasture or hay is an effective way of controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, increased runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet or very dry periods help keep the soil in good condition.

This soil is in capability subclass IIIe.

178—Waukee loam, 0 to 2 percent slopes. This nearly level, well drained soil is on benches along streams and on outwash plains of uplands. Individual areas are irregular in shape and are usually 5 to 15 acres in size.

Typically, the surface layer is very dark brown, friable loam about 9 inches thick. The subsurface layer is very dark grayish brown and dark brown, friable loam about 10 inches thick. The subsoil is about 21 inches thick. The upper part is brown, friable loam. The middle part is dark yellowish brown, friable loam. The lower part is dark yellowish brown, friable loamy coarse sand. To a depth of about 60 inches, the substratum is yellowish brown, loose gravelly sand.

Included with this soil in mapping are a few small areas of Sparta and Dickinson soils on higher lying

positions of the landscape. These soils are higher in sand content and are more droughty than this Waukee soil. Also included are small areas of Saude and Lawler soils. The Saude soils are on higher positions, are shallower to coarse textured materials, and are less productive than the Waukee soil. These areas make up 5 to 10 percent of the unit.

This soil has moderate permeability in the loamy material and very rapid permeability in the underlying coarse sand and gravel. Surface runoff is slow. The available water capacity is moderate. This soil has good tilth. Generally, the surface layer is slightly acid. The subsoil is low in available phosphorus and very low in available potassium. The surface layer is about 3 to 4 percent organic matter.

Most areas of this soil are in cultivated crops and hay. The soil has good potential for cultivated crops, hay, pasture, and trees. It has fair potential for most engineering uses, but there is a pollution hazard if the soil is used for onsite sewage treatment.

This soil is well suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. It is somewhat droughty during years of below average rainfall. It puddles if worked when wet. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility, reduce moisture losses, and increase the infiltration of water. The need for lime in the surface layer varies according to previous liming practices. Because of the acidity, this soil needs lime if it has not been applied in the past 3 or 4 years.

If this soil is used for pasture, grazing should be restricted during wet periods. Overgrazing or grazing when the soil is too wet, however, causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing also help keep the pasture and soil in good condition.

This soil is in capability subclass IIs.

178B—Waukee loam, 2 to 5 percent slopes. This gently sloping, well drained soil is on benches along streams and on outwash plains of uplands. Individual areas are irregular in shape and are usually 5 to 15 acres in size.

Typically, the surface layer is very dark brown, friable loam about 9 inches thick. The subsurface layer is very dark grayish brown and dark brown, friable loam about 10 inches thick. The subsoil is about 21 inches thick. The upper part is brown, friable loam. The middle part is dark yellowish brown, friable loam. The lower part is dark yellowish brown, friable loamy sand. To a depth of about 60 inches, the substratum is yellowish brown, loose fine and medium sand. In a few areas the depth to fine and medium sand is as shallow as 28 inches.

Included with this soil in mapping are a few small areas of Sparta and Dickinson soils on higher positions of the landscape. These soils are higher in sand content and are more droughty than this Waukee soil. These areas make up less than 5 percent of the unit.

This soil has moderate permeability in the loamy material and very rapid permeability in the underlying coarse sand and gravel. Surface runoff is slow. The available water capacity is moderate. This soil has good tilth. Generally, the surface layer is slightly acid. The subsoil is low in available phosphorus and very low in available potassium. The surface layer is about 3 to 4 percent organic matter.

Most areas of this soil are in cultivated crops and hay. The soil has good potential for growing cultivated crops, hay, pasture, and trees. It has fair potential for most engineering uses, but there is a pollution hazard when used for onsite sewage treatment.

This soil is well suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, it is subject to erosion. This soil is somewhat droughty during years of below normal rainfall. It puddles if worked when wet. Conservation practices that leave crop residue on the surface help reduce soil erosion and conserve moisture. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and increase the infiltration of water.

The use of this soil for pasture or hay is an effective way of controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, increased runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is in capability subclass IIe.

179D2—Gara loam, 9 to 14 percent slopes, moderately eroded. This strongly sloping, moderately well drained soil is in uplands. It is on convex side slopes. Individual areas are irregular in shape and are usually 5 to 30 acres in size.

Typically, the surface layer is about 7 inches of very dark grayish brown, friable loam mixed with dark yellowish brown, friable clay loam material from the subsoil. The subsoil is about 37 inches thick. The upper part is dark yellowish brown, friable clay loam. The middle part is brown, firm clay loam. The lower part is yellowish brown, firm clay loam. The substratum is yellowish brown, firm clay loam to a depth of about 60 inches.

Included with this soil in mapping are a few small areas of clay or clay loam soils that are somewhat poorly drained. These areas are on high shoulders and make up less than 5 percent of the unit.

This soil has moderately slow permeability. Surface runoff is rapid. The available water capacity is high. The subsoil is generally low in available phosphorus and very low in available potassium. The surface layer is about 1 to 1 1/2 percent organic matter.

Most areas of this soil are in hay and pasture. The soil has poor potential for cultivated crops but has fair

potential for hay, pasture, and trees. It has fair potential for most engineering uses.

This soil is not suited to growing corn year after year. It is better suited to a crop rotation of corn, small grains, and hay and to grasses for pasture. If this soil is used for cultivated crops, it is subject to severe erosion. It is difficult to till, tends to puddle if worked when wet, and can crust after hard rains. Seedling development is retarded if crusting occurs prior to emergence. Contour stripcropping and conservation practices that leave a crop residue on the surface help reduce soil loss. Many areas have slopes long and smooth enough to be terraced and farmed on the contour. Cuts for terraces should be held to a minimum to reduce exposure of the underlying subsoil, which is very low in fertility. Since the plow layer is intermixed with subsoil, the soil is generally less responsive to fertilizer and might require additional management practices. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility, reduce crusting, and increase the infiltration of water. The need for lime in the plow layer varies according to previous liming practices. Generally, the soil needs lime if it has not been applied in the past 3 or 4 years.

The use of this soil for pasture or hay is an effective way of controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, increased runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is moderately suited to trees. Tree seeds, cuttings, and seedlings survive and grow if competing vegetation is controlled or removed. This can be accomplished by site preparation; by prescribed burning; or by srpaying, cutting, or girdling. Additional fertilizer is needed because of the low fertility of the soil.

This soil is in capability subclass IVe.

184—Klinger silt loam, 1 to 3 percent slopes. This very gently sloping, somewhat poorly drained soil is on concave side slopes and toe slopes in uplands. Individual areas are long and irregular in shape and are usually 20 to 100 acres or more in size.

Typically, the surface layer is black, friable silt loam about 8 inches thick. The subsurface layer is very dark brown, friable silty clay loam about 9 inches thick. The subsoil is about 24 inches thick. The upper part is dark grayish brown, friable silty clay loam. The middle part is dark grayish brown and yellowish brown, friable silty clay loam and light olive brown and dark grayish brown, friable loam. The lower part is yellowish brown, firm loam mottled with grayish brown. To a depth of about 60 inches, the substratum is yellowish brown, firm loam with light brownish gray mottles.

Included with this soil in mapping are a few small areas of poorly drained Ansgar soils in shallow drainageways or swales. These soils are wet so that field operations can be hampered. These areas make up between 5 and 10 percent of the unit.

This soil is moderately permeable. The upper part of the soil is more permeable than the lower part of the subsoil and the substratum. Surface runoff is slow. This soil has good tilth. The available water capacity is high. A seasonal high water table is at a depth of 2 to 4 feet. The subsoil is generally very low in available phosphorus and potassium. The surface layer is about 5 to 6 percent organic matter.

Most areas of this soil are in cultivated crops. The soil has good potential for cultivated crops, hay, pasture, and trees. It has fair potential for most engineering uses.

This soil is well suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. This soil can be used intensively for corn and soybeans. It has a seasonal high water table and slow runoff. It tends to puddle if worked when wet. Even though tillage can be performed without subsurface drains, installing drains is beneficial and makes earlier field operations possible. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and maintain good tilth. The need for lime in the surface layer varies according to previous liming practices. Generally, this soil needs lime if it has not been applied in the past 3 to 5 years.

The use of this soil for pasture should be restricted during wet periods. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is in capability class I.

213B—Rockton loam, 30 to 40 inches to limestone, 2 to 5 percent slopes. This gently sloping, well drained soil is on convex ridges. Individual areas are irregular in shape and are usually 5 to 25 acres in size.

Typically, the surface layer is black, friable loam about 9 inches thick. The subsurface layer is very dark grayish brown, friable loam about 5 inches thick. The subsoil is about 20 inches thick. The upper part is dark yellowish brown, friable loam. The lower part is brown, friable loam. Limestone bedrock is at a depth of about 34 inches. In a few areas the limestone is at a depth of 24 inches.

This soil has moderate permeability. Surface runoff is medium. The available water capacity is moderate. This soil has good tilth. The subsoil is generally very low in available phosphorus and potassium. The surface layer is 3 to 3 1/2 percent organic matter.

Most areas of this soil are in cultivated crops and hay. This soil has good potential for cultivated crops, hay, pasture, and trees. It has poor potential for most engineering uses, and there is a pollution hazard if the soil is used for onsite sewage treatment.

This soil is well suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture.

If this soil is used for cultivated crops, it is subject to wind and water erosion. This soil is droughty when rainfall is below normal. It tends to puddle if worked when wet. Conservation practices that leave crop residue on the surface help reduce soil erosion and conserve moisture. Terrace construction is difficult in some areas because of the shallowness of the soil to bedrock. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve soil fertility and maintain good tilth. The need for lime in the surface layer varies according to previous liming practices. Generally, this soil needs lime if it has not been applied in the past 3 to 5 years.

The use of this soil for pasture or hay is an effective way of controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, increased runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet and extremely dry periods help keep the pasture and soil in good condition.

This soil is in capability subclass IIe.

214B—Rockton loam, 20 to 30 inches limestone, 2 to 5 percent slopes. This gently sloping, well drained soil is on convex ridges. Individual areas are irregular in shape and are usually 5 to 25 acres in size.

Typically, the surface layer is black, friable loam about 9 inches thick. The subsurface layer is very dark grayish brown, friable loam about 5 inches thick. The subsoil is about 11 inches thick. The upper part is dark yellowish brown, friable loam. The lower part is brown, friable loam. Limestone bedrock is at a depth of about 25 inches. In a few areas the limestone is at a depth of 36 inches.

This soil has moderate permeability. Surface runoff is medium. The available water capacity is low. This soil has good tilth. The subsoil is generally very low in available phosphorus and potassium. The surface layer is 3 to 3 1/2 percent organic matter.

Most areas of this soil are in cultivated crops, hay, and pasture. This soil has fair potential for cultivated crops, hay, pasture, and trees. It has poor potential for most engineering uses, and there is a pollution hazard if this soil is used for onsite sewage treatment.

This soil is suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, it is subject to wind and water erosion. This soil is very droughty unless rainfall is above normal and timely. It tends to puddle if worked when wet. Conservation practices that leave crop residue on the surface help reduce soil erosion and conserve moisture. Terrace construction is poorly suited to this soil because of shallow depth to bedrock. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve soil fertility and maintain good tilth. The need for lime in the surface layer varies according to previous liming practices. Generally, this soil needs lime if it has not been applied in the past 3 to 5 years.

The use of this soil for pasture or hay is an effective way of controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, increased runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet and very dry periods help keep the pasture and soil in good condition.

This soil is in capability subclass IIe.

214C—Rockton loam, 20 to 30 inches to limestone, 5 to 9 percent slopes. This moderately sloping, well drained soil is on convex ridges and side slopes. Individual areas are irregular in shape and are usually 5 to 15 acres in size.

Typically, the surface layer is black, friable loam about 9 inches thick. The subsurface layer is very dark grayish brown, friable loam about 5 inches thick. The subsoil is about 11 inches thick. The upper part is dark yellowish brown, friable loam. The lower part is brown, friable loam. Limestone bedrock is at a depth of about 25 inches. In a few areas the limestone is at a depth of 36 inches.

This soil has moderate permeability. Surface runoff is medium. The available water capacity is low. This soil has good tilth. The subsoil is generally very low in available phosphorus and potassium. The surface layer is 3 to 3 1/2 percent organic matter.

Most areas of this soil are in cultivated crops, hay, and pasture. This soil has poor potential for cultivated crops but fair potential for hay, pasture, and trees. It has poor potential for most engineering uses, and there is a pollution hazard if the soil is used for onsite sewage treatment.

This soil is poorly suited to corn, soybeans, and small grains. It is better suited to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, it is subject to wind and water erosion. This soil is very droughty unless rainfall is above normal and timely. It tends to puddle if worked when wet. Conservation practices that leave crop residue on the surface help reduce soil erosion and conserve moisture. Terracing is difficult because this soil is shallow to bedrock. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve soil fertility and maintain good tilth. The need for lime in the surface layer varies according to previous liming practices. Generally, this soil needs lime if it has not been applied in the past 3 to 5 years.

The use of this soil for pasture or hay is an effective way of controlling erosion. Overgrazing or grazing when the soil is wet, however, causes surface compaction, increased runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing, and restricted use during wet and very dry periods help keep the pasture and soil in good condition.

This soil is in capability subclass IIIe.

216B—Ripon silt loam, 20 to 30 inches to limestone, 2 to 5 percent slopes. This gently sloping,

well drained soil is in uplands. It is on convex ridges. Individual areas are irregular in shape and are usually 5 to 20 acres in size.

Typically, the surface layer is very dark brown, friable silt loam about 13 inches thick. The subsurface layer is very dark grayish brown, friable silty clay loam about 5 inches thick. The subsoil is about 11 inches thick. The upper part is brown, firm silty clay loam. The lower part is reddish brown, firm clay. It is residuum and small fragments of hard limestone and soft, weathered limestone, which increases with depth. Fractured limestone bedrock is at a depth of about 29 inches. A residuum of reddish brown clay is between the fractures. In a few areas the limestone is at a depth of 36 inches.

This soil has moderate permeability. Surface runoff is medium. The available water capacity is low. This soil has good tilth. The subsoil is generally low in available phosphorus and very low in available potassium. The surface layer is about 3 to 4 percent organic matter.

Most areas of this soil are in cultivated crops, hay, and pasture. This soil has fair potential for cultivated crops, hay, pasture, and trees. It has poor potential for most engineering uses, and there is a pollution hazard if this soil is used for onsite sewage treatment.

This soil is suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, it is subject to erosion. This soil is droughty unless rainfall is above normal and timely. It tends to puddle if worked when wet. Conservation practices that leave crop residue on the surface help reduce soil erosion and conserve moisture. In addition, stripcropping helps reduce erosion. Terracing is difficult on this soil because of the shallow depth to bedrock. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve soil fertility and maintain good tilth. The need for lime in the surface layer varies according to previous liming practices. Generally, this soil needs lime if it has not been applied in the past 3 to 5 years.

This soil is in capability subclass IIe.

216C—Ripon silt loam, 20 to 30 inches to limestone, 5 to 9 percent slopes. This moderately sloping, well drained soil is in uplands. It is on convex ridges and side slopes. Individual areas are irregular in shape and are usually 5 to 20 acres in size.

Typically, the surface layer is very dark brown, friable silt loam about 9 inches thick. The subsurface layer is very dark grayish brown, friable silty clay loam about 5 inches thick. The subsoil is about 11 inches thick. The upper part is brown, firm silty clay loam. The lower part is reddish brown, firm clay. It is residuum and small fragments of limestone and soft, weathered limestone, which increases with depth. Fractured limestone bedrock is at a depth of about 26 inches. A residuum of reddish brown clay is between fractures. In a few areas the limestone is at a depth of 36 inches.

This soil has moderate permeability. Surface runoff is medium. The available water capacity is low. This soil has good tilth. The subsoil is generally low in available phosphorus and very low in available potassium. The surface layer is about 3 to 4 percent organic matter.

Most areas of this soil are in cultivated crops, hay, and pasture. The soil has fair potential for cultivated crops, hay, pasture, and trees. It has poor potential for most engineering uses, and there is a pollution hazard if the soil is used for onsite sewage treatment.

This soil is suited to corn, soybeans, and small grains and to growing grasses and legumes for hay and pasture. If this soil is used for cultivated crops, it is subject to erosion. This soil is droughty unless rainfall is above normal and timely. It tends to puddle if worked when wet. Conservation practices that leave crop residue on the surface help reduce soil erosion and conserve moisture. In addition, stripcropping helps reduce erosion. Terracing is difficult on this soil because of the shallow depth to bedrock. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve soil fertility and maintain good tilth. The need for lime in the surface layer varies according to previous liming practices. Generally, this soil needs lime if it has not been applied in the past 3 to 5 years.

The use of this soil for pasture or hay is an effective way of controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, increased runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet and very dry periods help keep the pasture and soil in good condition.

This soil is in capability subclass IIIe.

217B—Ripon silt loam, 30 to 40 inches to limestone, 2 to 5 percent slopes. This gently sloping, well drained soil is in uplands. It is on convex ridges. Individual areas are irregular in shape and are usually 25 to 75 acres in size.

Typically, the surface layer is very dark brown, friable silt loam about 13 inches thick. The subsurface layer is very dark grayish brown, friable silty clay loam about 5 inches thick. The subsoil is about 19 inches thick. The upper part is brown, firm silty clay loam. The lower part is reddish brown, firm clay. It is residuum and small fragments of limestone and soft, weathered limestone, which increases with depth. Fractured limestone bedrock is at a depth of about 37 inches. A residuum of reddish brown clay is between the fractures. In a few areas the limestone is at a depth of 24 inches.

This soil has moderate permeability. Surface runoff is medium. The available water capacity is moderate. This soil has good tilth. The subsoil is generally low in available phosphorus and very low in available potassium. The surface layer is about 3 to 4 percent organic matter.

Most areas of this soil are in cultivated crops and hay. The soil has good potential for cultivated crops, hay, pasture, and trees. It has poor potential for most

engineering uses, and there is a pollution hazard if the soil is used for onsite sewage treatment.

This soil is well suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, it is subject to erosion. This soil is droughty when rainfall is below normal. It tends to puddle if worked when wet. Conservation practices that leave crop residue on the surface help reduce erosion and conserve moisture. In addition, stripcropping helps reduce erosion. Terracing is difficult in some areas because of the shallowness to bedrock. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve soil fertility and maintain good tilth. The need for lime in the surface layer varies according to previous liming practices. Generally, this soil needs lime if it has not been applied in the past 3 to 5 years.

The use of this soil for pasture or hay is an effective way of controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, increased runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet and extremely dry periods help keep the pasture and soil in good condition.

This soil is in capability subclass IIe.

217C—Ripon silt loam, 30 to 40 inches to limestone, 5 to 9 percent slopes. This moderately sloping, well drained soil is in uplands. It is on convex ridges and side slopes. Individual areas are irregular in shape and are usually 5 to 20 acres in size.

Typically, the surface layer is very dark brown, friable silt loam about 9 inches thick. The subsurface layer is very dark grayish brown, friable silty clay loam about 5 inches thick. The subsoil is about 19 inches thick. The upper part is brown, firm silty clay loam. The lower part is reddish brown, firm clay. It is residuum and small fragments of limestone and soft weathered limestone, which increases with depth. Fractured limestone bedrock is at a depth of about 34 inches. A residuum of reddish brown clay is between fractures. In a few areas the limestone is at a depth of 24 inches.

This soil has moderate permeability. Surface runoff is medium. The available water capacity is moderate. This soil has good tilth. The subsoil is generally low in available phosphorus and very low in available potassium. The surface layer is about 3 to 4 percent organic matter.

Most areas of this soil are in cultivated crops and hay. This soil has fair potential for cultivated crops, hay, pasture, and trees. It has poor potential for most engineering uses, and there is a pollution hazard if the soil is used for onsite sewage treatment.

This soil is suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, it is subject to erosion. This soil is droughty when rainfall is below normal. It tends to puddle if worked when wet. Conservation practices that leave crop residue on the surface help reduce soil erosion and conserve moisture. In addition, stripcropping helps reduce erosion. Terracing is difficult in some areas because of the shallowness to bedrock. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve soil fertility and maintain good tilth. The need for lime in the surface layer varies according to previous liming practices. Generally, this soil needs lime if it has not been applied in the past 3 to 5 years.

The use of this soil for pasture or hay is an effective way of controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, increased runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet and extremely dry periods help keep the pasture and soil in good condition.

This soil is in capability subclass IIIe.

221—Palms muck, 0 to 3 percent slopes. This nearly level to very gently sloping, very poorly drained soil is in seeps on hillsides, in drainageways of uplands, and in shallow depressions of alluvial flood plains. This soil is subject to frequent flooding. Individual areas are broad and irregular in shape and are usually 50 to 100 acres or more in size.

Typically, the surface layer is black, friable organic material about 13 inches thick. The subsurface layer is black, friable organic material 26 inches thick. The substratum is gray and black, friable silty clay loam to a depth of about 60 inches.

Included in mapping are some areas where the organic material is 50 inches or more thick. These areas make up less than 5 percent of the unit.

This soil has moderately rapid permeability in the organic layers and moderate permeability in the underlying mineral material. The available water capacity is high. A seasonal high water table is at a depth of 1 foot or less. The tilth of this soil is good in some areas if adequate drainage has been established. This soil is mildly alkaline or neutral throughout. The subsoil generally is low in available phosphorus and very low in available potassium. The surface layer is 20 percent or more organic matter.

Where adequate drainage has been established, this soil is used mostly for row crops. Undrained areas remain in pasture or are left idle. This soil has poor potential for cultivated crops and has fair potential for pasture. It has poor potential for most engineering uses.

This soil is poorly suited to corn, soybeans, and small grains. It is better suited to corn and vegetable crops, however, if it is adequately drained. It is suited to water-tolerant grasses for pasture. The water table is at or near the surface during much of the year unless this soil is drained. Subsurface drains need to be placed in the underlying mineral layers. In some areas installation of subsurface drains is difficult because of the variability in depth to these mineral layers. Outlets for drains are

difficult to find in some areas. Considerable settling takes place after these soils are drained. The application of lime is not necessary because of the neutral or alkaline reaction of the soil.

If this soil is used for pasture, overgrazing or grazing when the soil is too wet causes considerable loss because the grass is trampled into the easily compacted surface. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is in capability subclass IIIw.

226—Lawler loam, 32 to 40 inches to sand and gravel, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on benches along streams and on outwash plains in uplands. Individual areas are irregular in shape and are usually 10 to 50 acres in size.

Typically, the surface layer is black, friable loam about 8 inches thick. The subsurface layer is very dark grayish brown, friable loam about 9 inches thick. The subsoil is about 24 inches thick. The upper part is dark grayish brown, friable loam. The middle part is grayish brown, friable loam mottled with yellowish brown and strong brown. The lower part is grayish brown, friable loamy sand. To a depth of about 60 inches, the substratum is light brownish gray and light gray, friable fine and medium sand with yellowish brown mottles.

Included with this soil in mapping are a few small areas of poorly drained Marshan soils. Field operations in spring can be delayed in these areas because the Marshan soils, in lower-lying swales, stay wet longer than the Lawler soil. These areas make up 5 to 10 percent of the unit.

This soil has moderate permeability in the loamy material and very rapid permeability in the underlying sand and gravel. Surface runoff is slow. The available water capacity is moderate. A seasonal high water table is at a depth of 2 to 4 feet. This soil has good tilth. The subsoil is generally very low in available phosphorus and potassium. The surface layer is about 4 to 5 percent organic matter.

Most areas of this soil are in cultivated crops. This soil has good potential for cultivated crops, hay, pasture, and trees. It has poor potential for most engineering uses, and there is a pollution hazard if the soil is used for onsite sewage treatment.

This soil is well suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. It puddles if worked when wet. This soil benefits from subsurface drains during wet years. Placement of drains is difficult in places because of loose, water-bearing sand and gravel at a depth of 3 feet. In years of below-average rainfall, this soil can be droughty, especially in areas where it is shallower to the underlying sand and gravel. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps to improve fertility and increase the infiltration of water. The need for lime in the surface layer varies according to previous liming practices. Generally, this soil needs lime if it has not been applied in the past 3 or 4 years.

If this soil is used for pasture, grazing should be restricted during wet periods. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is in capability subclass IIs.

249—Zwingle silt loam, 0 to 2 percent slopes. This nearly level, poorly drained soil is on high benches along the Mississippi River and the lower reaches of its larger tributaries. Individual areas are broad and irregular in shape and are usually 10 to 40 acres in size.

Typically, the surface layer is very dark gray, friable silt loam about 3 inches thick. The subsurface layer is pale brown, friable silt loam about 7 inches thick. The subsoil is about 48 inches thick. The upper part is yellowish brown, friable silty clay loam. The middle part is dark brown, brown, and grayish brown clay that is firm. It has strong brown and yellowish brown mottles. The lower part is grayish brown, firm clay mottled with yellowish brown. To a depth of about 60 inches, the substratum is brown, firm silty clay and thin, reddish brown strata.

Included with this soil in mapping are a few areas of moderately well drained soils. These soils are immediately adjacent to limestone bluffs. These areas make up 15 to 18 percent of the unit.

This soil has very slow permeability. Surface runoff is slow. The available water capacity is high. A seasonal high water table is at a depth of 1 foot to 2 feet. The tilth of this soil is good, except where cultivation has exposed the clayey subsoil. The soil in these exposed clayey areas has poor tilth. The subsoil is generally very low in available phosphorus and medium in available potassium. The surface layer is about 1/2 to 1 percent organic matter.

Most areas of this soil are in hay or pasture. This soil has poor potential for cultivated crops but fair potential for hay, pasture, and trees. It has poor potential for most engineering uses.

This soil is poorly suited to corn, soybeans, and small grains. It is better suited to trees or grasses for hay and pasture. In most cases if this soil is used for cultivated crops, the yields are low. Where the clayey subsoil has been exposed, the soil does not scour well if plowed. This soil also tends to puddle if worked when wet and crust after hard rains. Seedling development is retarded if crusting occurs prior to emergence. Subsurface drains do not work well on this poorly drained soil because the high clay content causes very slow permeability. Because of the very slow permeability, surface water ponds on very flat surfaces or in depressional areas after a heavy rain. This water often remains on the surface for extended periods of time and further hampers crop

production. Surface drains can be used to remove the excess water. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and soil tilth. The need for lime in the surface layer varies according to previous liming practices. Because of the acidity, this soil needs lime if it has not been applied in the past 3 or 4 years.

If this soil is used for pasture, grazing should be restricted during wet periods. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is moderately suited to trees that tolerate wet soils. Tree seeds, cuttings, and seedlings survive and grow if competing vegetation is controlled or removed. Equipment limitations are severe because of the seasonal high water table. Subsurface drains are needed to improve the soil conditions for operations of machinery and to reduce seedling mortality.

This soil is in capability subclass IIIw.

249B—Zwingle silt loam, 2 to 5 percent slopes. This gently sloping, poorly drained soil is on high benches along the Mississippi River and the lower reaches of its larger tributaries. Individual areas are irregular in shape and are usually 5 to 20 acres in size.

Typically, the surface layer is very dark gray, friable silt loam about 3 inches thick. The subsurface layer is pale brown, friable silt loam about 7 inches thick. The subsoil is about 47 inches thick. The upper part is yellowish brown, friable silty clay loam. The middle part is dark brown, brown, and grayish brown clay that is firm. It has strong brown and yellowish brown mottles. The lower part is grayish brown, firm clay mottled with yellowish brown. To a depth of about 60 inches, the substratum is brown, firm silty clay and thin, reddish brown strata.

Included with this soil in mapping are a few scattered areas of a soil that has gravel or limestone at a depth of less than 48 inches. This soil has a limited amount of water available for plant growth. These areas make up less than 5 percent of the unit.

This soil has very slow permeability. Surface runoff is medium. The available water capacity is high. A seasonal high water table is at a depth of 1 foot to 2 feet. The tilth of this soil is good, except where erosion has exposed the clayey subsoil. The soil in these exposed clayey areas has poor tilth. Generally, this soil is strongly acid. The subsoil is very low in available phosphorus and has medium available potassium. The surface layer is about 1/2 to 1 percent organic matter.

Most areas of this soil are in hay or pasture. The soil has poor potential for growing cultivated crops but fair potential for growing hay, pasture, and trees. It has poor potential for most engineering uses.

This soil is poorly suited to corn, soybeans, and small grains. It is better suited to trees or grasses for hay and pasture. In most cases if this soil is used for cultivated crops, the yields are low. If cropped, this soil is subject to erosion. Where the clayey subsoil is exposed, the soil does not scour well if plowed. Subsurface drains do not work well on this poorly drained soil because the high clay content causes very slow permeability. This soil tends to puddle if worked when wet and crusts after hard rains. Seedling development is retarded if crusting occurs prior to emergence. Fields should be plowed across the slope to reduce runoff. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and soil tilth. The need for lime in the surface layer varies according to previous liming practices. Because of the acidity, this soil needs lime if it has not been applied in 3 or 4 years.

The use of this soil for pasture is an effective way of controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is moderately suited to growing trees that tolerate wet soils. Tree seeds, cuttings, and seedlings survive and grow if competing vegetation is controlled or removed. Equipment limitations are severe because of the seasonal high water table. Subsurface drains are needed to improve the soil conditions, to make operating equipment easier, and to reduce seedling mortality.

This soil is in capability subclass IIIe.

284B—Flagler sandy loam, 1 to 5 percent slopes. This gently sloping, somewhat excessively drained soil is on benches along streams and outwash plains of uplands. Slopes are convex. Individual areas are regular in shape and are usually 3 to 10 acres in size. A few areas are as large as 30 acres.

Typically, the surface layer is very dark brown, friable sandy loam about 7 inches thick. The subsurface layer is very dark brown and very dark grayish brown, friable sandy loam about 12 inches thick. The subsoil is about 16 inches thick. The upper part is brown, friable sandy loam. The lower part is brown, very friable sandy loam. To a depth of about 60 inches, the substratum is brown, loose sand and about 7 percent gravel and a thin strata of gravelly sand.

This soil has moderately rapid permeability in the loamy material and very rapid permeability in the underlying sand and gravel. Surface runoff is medium. The available water capacity is low. The tilth of this soil is good. This soil is typically acid in the surface layer. The subsoil is generally low in available phosphorus and very low in available potassium. The surface layer is about 1 1/2 to 2 1/2 percent organic matter.

Most areas of this soil are in cultivated crops, hay, and pasture. This soil has fair potential for these uses. It has fair potential for most engineering uses, but there is a pollution hazard if the soil is used for onsite sewage treatment.

This soil is suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, it is subject to wind and water erosion. This soil is droughty, and crop production is low unless rainfall is above normal and timely. Conservation practices that leave crop residue on the surface help reduce soil erosion and conserve moisture. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve soil fertility and increase the infiltration of water. The need for lime in the surface layer varies according to previous liming practices. Because of the acidity, this soil needs lime if it has not been applied in the past 3 to 5 years.

The use of this soil for pasture or hay is an effective way of controlling erosion. Proper stocking rates; pasture rotation; and timely deferment of grazing, especially during dry periods, help keep the pasture and soil in good condition.

This soil is in capability subclass IIIe.

284C—Flagler sandy loam, 5 to 9 percent slopes. This moderately sloping, somewhat excessively drained soil is on benches along streams and on outwash plains of uplands. Slopes are convex. Individual areas are regular in shape and are usually 3 to 10 acres in size.

Typically, the surface layer is very dark brown, friable sandy loam about 7 inches thick. The subsurface layer is very dark brown and very dark grayish brown, friable fine sandy loam about 7 inches thick. The subsoil is about 16 inches thick. The upper part is brown, friable sandy loam. The lower part is brown, very friable sandy loam. To a depth of about 60 inches, the substratum is brown, loose sand and about 7 percent gravel and a thin strata of gravelly sand. In some areas the surface layer is brown, friable sandy loam.

This soil has moderately rapid permeability in the loamy material and very rapid permeability in the underlying sand and gravel. Surface runoff is medium. The available water capacity is low. The tilth of this soil is good. This soil is typically acid in the surface layer. The subsoil is generally low in available phosphorus and very low in available potassium. The surface layer is about 1 1/2 to 2 1/2 percent organic matter.

Most areas of this soil are in cultivated crops, hay, and pasture. The soil has fair potential for these uses. It has fair potential for most engineering uses, but there is a pollution hazard if this soil is used for onsite sewage treatment.

This soil is poorly suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, it is subject to wind and water erosion. This soil is droughty, and crop production is low unless rainfall is above normal and timely. Conservation practices that leave crop residue on the surface help reduce soil erosion and conserve moisture. Returning crop residue to the surface or the regular addition of other organic material into the plow layer also helps improve soil fertility and increase the infiltration of water. The need for lime in the surface layer varies according to previous liming practices. Because of the acidity, this soil needs lime if it has not been applied in the past 3 to 5 years.

The use of this soil for pasture or hay is an effective way of controlling erosion. Proper stocking rates; pasture rotation; and timely deferment of grazing, especially during dry periods, help keep the pasture and soil in good condition.

This soil is in capability subclass IIIe.

285B—Burkhardt sandy loam, 2 to 5 percent slopes. This gently sloping, excessively drained soil is on benches along streams and on outwash plains of uplands. Individual areas are irregular in shape and are usually 5 to 10 acres in size.

Typically, the surface layer is very dark brown, very friable sandy loam and 2 to 3 percent fine gravel. It is about 8 inches thick. The subsurface layer is very dark grayish brown, very friable sandy loam and 2 to 3 percent fine gravel. It is about 6 inches thick. The subsoil is about 9 inches thick. The upper part is brown, friable sandy loam and 2 to 5 percent fine gravel. The lower part is dark yellowish brown, very friable loamy sand and about 5 percent fine gravel. To a depth of about 60 inches, the substratum is dark yellowish brown and yellowish brown, loose coarse sand and 10 to 20 percent gravel.

Included with this soil in mapping are small scattered areas where coarse gravel is on the surface. These areas are difficult to till and can cause excessive wear on farm machinery. These areas make up 5 to 10 percent of the unit.

This soil has moderately rapid permeability in the surface layer and subsoil and rapid permeability in the underlying material. Surface runoff is slow. The available water capacity is very low. The tilth of this soil is good. The subsoil is generally very low in available phosphorus and potassium. The surface layer is about 1/2 to 1 1/2 percent organic matter.

Most areas of this soil are in cultivated crops and hay. This soil has poor potential for cultivated crops and fair potential for hay and pasture. It has fair potential for most engineering uses, but there is a pollution hazard if this soil is used for onsite sewage treatment.

This soil is poorly suited to growing corn, soybeans, and small grains. It is better suited to growing grasses and legumes for hay and pasture. This soil is very droughty and is subject to wind erosion if it is cultivated. Conservation practices that leave crop residue on the surface help reduce soil blowing and conserve moisture. Crop yields are very dependent on the amount and timeliness of rainfall. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and maintain good tilth. The need for lime in the surface layer varies according to previous liming practices. Generally, this

soil needs lime if it has not been applied in the past 3 or 4 years.

The use of this soil for pasture or hay is effective in controlling erosion. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during dry periods help keep the pasture and soil in good condition.

This soil is in capability subclass IVs.

285D—Burkhardt sandy loam, 5 to 14 percent slopes. This moderately sloping to strongly sloping, excessively drained soil is on benches along streams and on outwash plains of uplands. Individual areas are irregular in shape and are usually 5 to 10 acres in size.

Typically, the surface layer is very dark brown and very dark grayish brown, very friable sandy loam and 2 to 3 percent fine gravel. It is about 11 inches thick. The subsoil is about 9 inches thick. The upper part is brown, very friable sandy loam and about 2 to 5 percent fine gravel. The lower part is dark yellowish brown, very friable loamy sand and about 5 percent fine gravel. To a depth of about 60 inches, the substratum is dark yellowish brown and yellowish brown, loose coarse sand and 10 to 20 percent gravel.

Included with this soil in mapping are scattered areas where coarse gravel is on the surface. These areas are difficult to till and can cause excessive wear on farm machinery. These areas make up 5 to 10 percent of the unit.

This soil has moderately rapid permeability in the surface layer and subsoil and rapid permeability in the underlying material. Surface runoff is medium. The available water capacity is very low. The tilth of this soil is good. The subsoil is generally very low in available phosphorus and potassium. The surface layer is about 1/2 to 1 1/2 percent organic matter.

Most areas of this soil are farmed with adjacent soils and are usually in a cropping system that is a rotation of corn, oats, and hay. This soil has poor potential for growing cultivated crops, hay, and pasture. It has fair potential for most engineering uses, but there is a hazard of pollution if this soil is used for onsite sewage treatment.

This soil is not suited to growing corn, soybeans, and small grains. It is better suited to growing grasses and legumes for hay and pasture. This soil is very droughty and is subject to wind and water erosion if it is cultivated. Conservation practices that leave crop residue on the surface help reduce the soil erosion and conserve moisture. Returning crop residue to the soil or the regular addition of other organic material into the plow layer helps improve fertility and maintian good tilth. The need for lime in the surface layer varies according to previous liming practices. Generally, this soil needs lime if it has not been applied in the past 3 to 4 years.

The use of this soil for pasture or hay is effective in controlling erosion. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during dry periods help keep the pasture and soil in good condition.

This soil is in capability subclass VIs.

285F2—Burkhardt sandy loam, 14 to 25 percent slopes, moderately eroded. This moderately steep to steep, excessively drained soil is on short escarpments of benches along streams and on outwash plains of uplands. Individual areas are irregular in shape and are usually 5 to 10 acres in size.

Typically, the surface layer is about 5 inches of very dark brown or very dark grayish brown, very friable sandy loam mixed with brown, very friable sandy loam material from the subsoil. It is 2 to 5 percent gravel. The subsoil is about 9 inches thick. The upper part is brown, very friable sandy loam and 2 to 5 percent fine gravel. The lower part is dark yellowish brown, very friable loamy sand and about 5 percent fine gravel. To a depth of about 60 inches, the substratum is dark yellowish brown and yellowish brown, loose coarse sand and 10 to 20 percent gravel. In some areas gravel is on the surface. In areas near Charlotte this soil is redder.

This soil has moderately rapid permeability in the surface layer and subsoil and rapid permeability in the underlying material. Surface runoff is rapid. The available water capacity is very low. The tilth of this soil is good. The subsoil is generally very low in available phosphorus and potassium. The surface layer is less than one-half percent organic matter.

Most areas of this soil are in hay or pasture. This soil has poor potential for cultivated crops, hay, and pasture. It has poor potential for most engineering uses, and there is a pollution hazard if this soil is used for onsite sewage treatment.

This soil is not suited to row crops. It is better suited to grasses and legumes for hay and pasture. This soil is very droughty and is subject to severe erosion. Crops on this soil should be grown only to reestablish grasses and legumes for hay and pasture. The regular addition of organic material into the plow layer helps improve fertility and maintain good tilth. The need for lime in the surface layer varies according to previous liming practices. Generally, this soil needs lime if it has not been applied in the past 3 or 4 years; however, it might not be possible to get the application equipment on these steep slopes.

The use of this soil for pasture or hay is effective in controlling erosion. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during dry periods help keep the pasture and soil in good condition.

This soil is in capability subclass VIIs.

291—Atterberry silt loam, 1 to 3 percent slopes. This very gently sloping, somewhat poorly drained soil is on divides of uplands, at heads of drainageways, at the base of slopes of uplands, and on loess-covered benches along Deep Creek and north of Goose Lake.

Individual areas are broad and irregular in shape and are usually 20 to 80 acres in size.

Typically, the surface layer is black and very dark gray, friable silt loam about 9 inches thick. The subsurface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsoil is 27 inches thick. The upper part is brown, friable silty clay loam mottled with yellowish brown. The middle part is grayish brown, friable silty clay loam mottled with yellowish brown and strong brown. The lower part is grayish brown, friable silty clay loam with strong brown mottles. To a depth of about 60 inches, the substratum is grayish brown, friable silt loam with yellowish brown mottles. In some places coarse sand is at a depth of 15 to 20 feet in the area along Deep Creek and north of Goose Lake.

Incuded with this soil in mapping are small areas of Walford soils. The Walford soils, formed in loess, are poorly drained and are in shallow depressions. These soils are usually wet during the spring, which can delay field operations. These areas make up 10 to 20 percent of the unit.

This soil has moderate permeability. Surface runoff is slow. The available water capacity is high. A seasonal high water table is at a depth of 1 foot to 3 feet. This soil has good tilth. The subsoil is low in available phosphorus and very low in available potassium. The surface layer is about 2 1/2 to 3 1/2 percent organic matter.

Most areas of this soil are in cultivated crops. The soil has good potential for cultivated crops, hay, pasture, and trees. It has poor potential for most engineering uses.

This soil is well suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. This soil is well suited to intensive row crops if it is properly managed. It tends to puddle if worked when wet. In some areas, plowing this soil mixes part of the subsurface layer into the plow layer, which causes crusting after hard rains. Seedling development is retarded if crusting occurs prior to emergence. Subsurface drains are generally needed to permit timely field operations. Where this soil is at the base of slopes, conservation practices are needed upslope to reduce runoff and siltation onto this soil. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and maintain good tilth. The need for lime in the surface layer varies according to liming practices performed in previous years. Generally, this soil needs lime if it has not been applied in the past 3 to 5 years.

If this soil is used for pasture, grazing should be restricted during wet periods. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is moderately well suited to trees if competing vegetation is controlled or removed. This can be accomplished by site preparation; by prescribed burning; or by spraying, cutting, or girdling.

This soil is in capability class I.

293E—Chelsea-Lamont-Fayette complex, 9 to 20 percent slopes. These moderately sloping to steep, well drained to excessively drained soils are on uplands that border major streams. They are on ridgetops and side slopes. These soils are so intricately mixed that it is impractical to separate tham in mapping. This complex consists of about 40 percent Chelsea soils, 30 percent Lamont soils, and 30 percent Fayette soils. Individual areas are irregular in shape and are usually 10 to 40 acres in size.

Typically, the Chelsea soil has a plow layer of dark brown, very friable loamy fine sand about 7 inches thick. The subsurface layer is dark yellowish brown, very friable loamy fine sand and yellowish brown, loose fine sand. It is about 27 inches thick. The subsoil is about 16 inches thick. It is light yellowish brown, loose fine sand. The substratum is yellowish brown and light yellowish brown, loose fine sand to a depth of about 60 inches.

Typically, the Lamont soil has a plow layer of very dark grayish brown and dark grayish brown, very friable fine sandy loam about 7 inches thick. The subsoil is about 20 inches thick. The upper part is brown, very friable fine sandy loam. The middle part is brown, very friable sandy loam. The lower part is dark yellowish brown, very friable sandy loam. The substratum is yellowish brown, very friable loamy sand and thin bands of brown, friable sandy loam to a depth of about 60 inches.

Typically, the Fayette soil has a plow layer of very dark grayish brown and dark grayish brown, friable silt loam about 7 inches thick. The subsoil is about 46 inches thick. The upper part is yellowish brown, friable silt loam. The lower part is yellowish brown, friable silty clay loam. To a depth of about 60 inches, the substratum is yellowish brown, friable silty loam with light brownish gray mottles.

The Chelsea soil has rapid permeability. The Lamont soil has moderately rapid permeability in the subsoil and rapid permeability in the substratum. The Fayette soil has moderate permeability. The surface runoff from these soils is medium to rapid. The available water capacity is very low for the Chelsea soil, is low for the Lamont soil, and is high for the Fayette soil. Generally, these soils are acid. The subsoil of the Chelsea soils is very low in available phosphorus and available potassium. The subsoil of the Lamont soils is medium in available phosphorus and very low in available potassium. The subsoil of the Fayette soils is high in available phosphorus and very low in available potassium. The Chelsea soils have very friable, loose consistence. The Lamont soils have good tilth, but the Fayette soils have fair tilth. The surface layer of the Chelsea and Lamont soils are less than one-half percent organic matter, and the Fayette soils are 1/2 to 1 1/2 percent organic matter.

Most areas of this map unit are in cultivated crops, hay, and pasture. This soil has poor potential for

cultivated crops but fair potential for hay, pasture, and trees. It has poor potential for most engineering uses.

These soils are poorly suited to corn, soybeans, and small grains. They are better suited to grasses and legumes for hay and pasture. If these soils are used for cultivated crops, they are subject to erosion. The Chelsea and Lamont soils are droughty and subject to soil blowing. Blowing sand from these soils can damage newly seeded crops. The Lamont and Fayette soils tend to puddle if worked when wet. As the Chelsea soils dry out, traction of farm machines becomes difficult because of the consistence. Conservation practices that leave crop residue on the surface help reduce soil erosion and conserve moisture. In addition, contour stripcropping helps reduce soil erosion. Terracing is difficult because of the irregular topography and the sandy areas, which have poor stability. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve soil fertility and tilth. The need for lime in the surface layer varies according to previous liming practices. Because of the acidity, these soils need lime if it has not been applied in the past 3 or 4 years.

The use of this soil for pasture or hay is an effective way to help reduce erosion. Overgrazing or grazing when the Fayette soil is too wet, however, causes surface compaction, increased runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during extremely wet and dry periods help keep the pasture and soil in good condition.

These soils are moderately suited to hardwood and coniferous trees of uplands. Tree seeds, cuttings, and seedlings survive and grow well if competing vegetation is controlled or removed. This can be accomplished by site preparation; by prescribed burning; or by spraying, cutting, or girdling. Seedling mortality is a moderate concern on the sandy Chelsea soil. The soil is droughty and trees might need supplemental water.

This soil is in capability subclass VIIe.

315—Fluvents-Ambraw complex, 0 to 2 percent slopes. These nearly level soils are somewhat excessively drained, well drained, and poorly drained. These soils are on the flood plains of major rivers in the county. They are so closely associated with one another that it is impractical to separate tham in mapping. The Fluvents, a broad group of alluvial soils, make up about 50 percent of the unit and are on slightly higher positions of the flood plain. The Ambraw soils, about 30 percent of the unit, are in depressions and old, sediment-filled oxbows of the flood plain. These soils are subject to frequent flooding. Individual areas are broad and irregular in shape and usually 200 acres or more in size.

Fluvents formed in recent, water-deposited sediments on the flood plains. These sediments range in age from only a few years to several hundred years. In this complex they are predominantly loamy and stratified. Stratified layers of sandy, silty, and clayey textures, however, are common.

The Ambraw soil has a surface layer of black, friable silty clay loam about 8 inches thick. The subsurface layer is very dark gray, friable loam about 14 inches thick. The subsoil is about 25 inches thick. The upper part is dark gray, friable loam with brown mottles. The middle part is gray, friable loam and sandy loam with brown mottles. The lower part is gray, friable sandy loam with brown mottles. To a depth of about 60 inches, the substratum is gray and grayish brown, very friable loamy fine sand mottled with olive brown.

The Fluvents have moderate permeability to rapid permeability. Surface runoff is slow. The available water capacity is low to moderate. Generally, the organic matter and the fertility levels in Fluvents are low.

The Ambraw soils have moderate permeability or moderately slow permeability. Surface runoff is slow, and water ponds in depressional areas. The available water capacity is high. A seasonal high water table is at a depth of 0 to 2 feet. The subsoil generally is low in available phosphorus and very low in available potassium. The surface layer is about 4 to 5 percent organic matter.

Most areas of this map unit are left idle and remain in brush or woodland. These soils have poor potential for cultivated crops and hay and fair potential for pasture. They have poor potential for most engineering uses.

These soils are poorly suited to corn, soybeans, and small grains. They are better suited to permanent grass in pasture and to woodland. These soils are frequently flooded and have a seasonal high water table. The level of the water is often controlled by the nearby river. These areas should be left idle or used for wildlife habitat.

This soil is in capability subclass Vw.

350—Waukegan silt loam, 0 to 2 percent slopes. This nearly level, well drained soil is on benches along streams and in uplands. Individual areas are irregular in shape and are usually 30 to 50 acres in size.

Typically, the surface layer is black, friable silt loam about 8 inches thick. The subsurface layer is very dark grayish brown, friable silt loam about 9 inches thick. The subsoil is about 24 inches thick. The upper part is brown, friable silt loam. The middle part is dark yellowish brown, friable silty clay loam. The lower part is yellowish brown, friable silty clay loam and sandy loam. The substratum is yellowish brown, loose loamy sand to a depth of about 60 inches.

This soil has moderate permeability in the silty material and very rapid permeability in the underlying sandy material. Surface runoff is slow. The available water capacity is moderate. The surface layer is friable and easy to till. The subsoil is generally low in available phosphorus and very low in available potassium. The surface layer is about 3 to 4 percent organic matter.

Most areas of this soil are in cultivated crops. This soil has good potential for cultivated crops, hay, pasture, and trees. It has fair potential for most engineering uses, but

there is a pollution hazard if this soil is used for onsite sewage treatment.

This soil is well suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. It is droughty when rainfall is below normal. Yields depend largely on the amount and timeliness of rainfall. The soil has a tendency to puddle if worked when wet. Conservation practices that leave residue on the surface help increase the infiltration of water and conserve moisture. Also, returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility. The need for lime in the surface layer varies according to previous liming practices. Generally, this soil needs lime if it has not been applied in the past 3 to 5 years.

If this soil is used for pasture, grazing should be restricted during wet and extremely dry periods. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is in capability subclass IIs.

350B—Waukegan silt loam, 2 to 5 percent slopes. This gently sloping, well drained soil is on benches along streams and in uplands. Slopes are convex. Individual areas are broad and irregular in shape and are usually 75 to 100 acres or more in size.

Typically, the surface layer is black, friable silt loam about 8 inches thick. The subsurface layer is very dark grayish brown, friable silt loam about 7 inches thick. The subsoil is about 20 inches thick. The upper part is brown, friable silt loam. The middle part is dark yellowish brown, friable silty clay loam. The lower part is yellowish brown, friable silty clay loam and sandy loam. The substratum is yellowish brown, loose loamy sand to a depth of about 60 inches.

Included with this soil in mapping are small areas of Dickinson soils. These soils, formed in sand, are on higher positions of the landscape. These soils are more droughty and lower in organic matter than the Waukegan soil. Areas of the Dickinson soil are scattered through the unit. They make 5 to 10 percent of the unit.

This soil has moderate permeability in the silty material and very rapid permeability in the sandy material. Surface runoff is medium. The available water capacity is moderate. The surface layer is friable and easy to till. The subsoil is generally low in available phosphorus and very low in the available potassium. The surface layer contains about 3 to 4 percent organic matter.

Most areas of this soil are in cultivated crops. This soil has fair potential for cultivated crops but has good potential for hay, pasture, and trees. It has fair potential for most engineering uses, but there is a pollution hazard if this soil is used for onsite sewage treatment.

This soil is suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, it is subject to erosion. This soil is droughty when rainfall is below normal. It has a tendency to puddle if worked when wet. Conservation practices that leave residue on the surface help reduce soil losses, increase infiltration of water, and conserve moisture. This soil has slopes that are long and smooth enough to be terraced. Channel cuts should be held to a minimum to avoid exposure of the coarse material, which is at a depth of 2 to 3 feet. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve soil fertility. The need for lime in the surface layer varies according to previous liming practices. Generally, the soil needs lime if it has not been applied in the past 3 to 5 years.

The use of this soil for pasture or hay is an effective way of controlling erosion. Overgrazing or grazing when the soil is wet causes surface compaction, increased runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet or very dry periods help keep the pasture and soil in good condition.

This soil is in capability subclass IIe.

350C—Waukegan silt loam, 5 to 9 percent slopes. This moderately sloping, well drained soil is on benches along streams and in uplands. It is on convex side slopes. Individual areas are short and irregular in shape and are usually 10 to 20 acres in size.

Typically, the surface layer is black and very dark grayish brown, friable silt loam about 11 inches thick. The subsoil is about 20 inches thick. The upper part is brown, friable silt loam. The middle part is dark yellowish brown, friable silty clay loam. The lower part is yellowish brown, friable silty clay loam and sandy loam. The substratum is yellowish brown, loose loamy sand to a depth of about 60 inches.

Included with this soil in mapping are a few small areas where gravel is exposed on the surface. This soil is droughty, low in organic matter, and difficult to till. It can cause excessive wear on farm mahinery. These areas make up less than 5 percent of the unit.

This soil has moderate permeability in the silty material and very rapid permeability in the underlying sandy material. Surface runoff is medium. The available water capacity is moderate. The surface layer is friable and easy to till. Generally, the subsoil is low in available phosphorus and very low in available potassium. The surface layer is about 3 to 4 percent organic matter.

Most areas of this soil are in cultivated crops and hay. This soil has fair potential for cultivated crops, hay, pasture, and trees. It has fair potential for most engineering uses, but there is a pollution hazard if this soil is used for onsite sewage treatment.

This soil is suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, it is subject to erosion. This soil is droughty when rainfall is below normal. It has a tendency to puddle if worked when wet. Conservation practices that leave crop residue on the surface help

reduce soil loss, increase the infiltration of water, and conserve moisture. Terracing can be difficult because of the short slopes. If terraces are used, channel cuts should be held to a minimum to avoid exposure of coarse material, which is at a depth of 2 to 3 feet. Returning crop residue to the surface or the regular addition of other organic material helps improve soil fertility. The need for lime in the surface layer varies according to previous liming practices. Generally, the soil needs lime if it has not been applied in the past 3 or 5 years. The use of this soil for pasture and hay is an effective way of controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, increased runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet and very dry periods help keep the pasture and soil in good condition.

This soil is in capability subclass IIIe.

351—Atterberry silt loam, sandy substratum, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is near heads of drainageways in the uplands and on loess-covered benches along streams. It formed in 40 to 60 inches of loess and in the underlying sandy material. Individual areas are broad and irregular in shape and are usually 40 to 100 acres or more in size.

Typically, the surface layer is very dark gray, friable silt loam about 8 inches thick. The subsurface layer is very dark grayish brown and dark grayish brown, friable silt loam about 8 inches thick. The subsoil is about 34 inches thick. The upper part is grayish brown, friable silt loam mottled with dark brown. The middle part is grayish brown and yellowish brown, friable silt loam. The lower part is strong brown and reddish brown, very friable sandy loam. The substratum is strong brown, very friable loamy sand to a depth of about 60 inches. In places are small areas of Muscatine soils, sandy substratum, and Garwin soils, sandy substratum.

Included with this soil in mapping are small areas of Thorp soils. Thorp soils, formed in loess and in the underlying sandy material, are poorly drained and are in depressions. These soils are ponded during wet seasons, which can hinder tillage. These areas make up 5 to 10 percent of the unit.

This soil has moderate permeability. Surface runoff is slow. The available water capacity is high. A seasonal high water table is at a depth of 2 to 4 feet. This soil has good tilth. The subsoil is low in available phosphorus and very low in available potassium. The surface layer contains about 2 1/2 to 3 1/2 percent organic matter.

Most areas of this soil are in cultivated crops. This soil has good potential for cultivated crops, hay, pasture, and trees. It has poor potential for most engineering uses.

This soil is well suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. This soil is suited to intensive row cropping if it is well managed. It has a seasonally high water table. It tends to puddle if worked when wet. In some areas, plowing this soil mixes part of the subsurface layer into the plow layer, which causes crusting after hard rains. Seedling development is retarded if crusting occurs prior to emergence. Subsurface drains permit timely field operations. The placement of drains can be difficult in some places because of the loose, water-bearing sands, which are at a depth of 4 feet. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and maintain good tilth. The need for lime in the surface layer varies according to liming practices performed in previous years. Generally, this soil needs lime if it has not been applied in the past 3 to 5 years.

If this soil is used for pasture, grazing should be restricted during wet periods. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is moderately well suited to trees. Tree seeds, cuttings, and seedlings survive and grow well if competing vegetation is controlled or removed. This can be accomplished by site preparation; by prescribed burning; or by spraying, cutting, or girdling.

This soil is in capability class I.

352B—Whittier silt loam, 2 to 5 percent slopes. This gently sloping, well drained soil is on benches along streams and in uplands. Individual areas are broad and irregular in shape and are usually 40 to 100 acres or more in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 9 inches thick. The subsurface layer is brown, friable silt loam about 4 inches thick. The subsoil is about 28 inches thick. The upper part is brown, friable silt loam. The middle part is brown and dark yellowish brown, friable silty clay loam. The lower part is pale brown and brown, friable silty clay loam and yellowish brown, very friable loamy sand. The substratum is stratified, yellowish brown and brown, loose fine sand to a depth of about 60 inches.

This soil has moderate permeability in the silty material and rapid permeability in the underlying sandy material. Surface runoff is medium. The available water capacity is moderate. The surface layer is friable and easy to till. The subsoil is generally low in available phosphorus and very low in available potassium. The surface layer is about 2 to 3 percent organic matter.

Most areas of this soil are in cultivated crops, hay, and pasture. This soil has fair potential for cultivated crops, but it has good potential for hay, pasture, and trees. It has fair potential for most engineering uses, but there is a pollution hazard if this soil is used for onsite sewage treatment.

This soil is suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, it is subject to erosion. This soil is droughty when rainfall is below normal. Yields

depend largely on the amount and timeliness of rainfall. The soil tends to puddle if worked when wet. Conservation practices that leave residue on the surface help reduce soil loss, increase the infiltration of water, and conserve moisture. This soil generally has slopes long and smooth enough to be terraced, but channel cuts should be held to a minimum to avoid exposure of coarse material, which is at a depth of 2 to 3 feet. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve soil fertility. The need for lime in the surface layer varies according to previous liming practices. Generally, the soil needs lime if it has not been applied in the past 3 or 4 years.

The use of this soil for pasture or hay is an effective way of controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, increased runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet and very dry periods help keep the pasture and soil in good condition.

This soil is moderately well suited to trees. Tree seeds, cuttings, and seedlings survive and grow well if competing vegetation is controlled or removed. This can be accomplished by site preparation; by prescribed burning; or by spraying, cutting, and girdling.

This soil is in capability subclass IIe.

353—Tell silt loam, 0 to 2 percent slopes. This nearly level, well drained soil is on benches along streams and in uplands. Individual areas are irregular in shape and are usually 20 to 40 acres in size.

Typically, the surface layer is very dark gray, friable silt loam about 4 inches thick. The subsurface layer is grayish brown, friable silt loam about 7 inches thick. The subsoil is about 28 inches thick. The upper part is brown, friable silty clay loam. The middle part is yellowish brown, friable silty clay loam. The lower part is brown, friable loam. The substratum is strong brown, friable loamy sand to a depth of about 60 inches.

This soil has moderate permeability in the surface layer and subsoil and rapid permeability in the substratum. Surface runoff is slow. The available water capacity is moderate. The surface layer is friable and easy to till. The subsoil is generally medium in available phosphorus and very low in available potassium. The surface layer is about 1 1/2 to 2 1/2 percent organic matter.

Most areas of this soil are in cultivated crops or hay, but some are still in woodland. This soil has fair potential for cultivated crops but has good potential for hay, pasture, and trees. It has fair potential for most engineering uses, but there is a pollution hazard if the soil is used for onsite sewage treatment.

This soil is suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. This soil is droughty when rainfall is below normal. Yields depend largely on the amount and timeliness of rainfall. This soil has a tendency to puddle if worked when wet and crust after hard rains. Seedling development is retarded if crusting occurs prior to emergence. Conservation practices that leave residue on the surface help increase the infiltration of water and conserve moisture. Also, returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and reduce crusting. The need for lime in the surface layer varies according to previous liming practices. Generally, this soil needs lime if it has not been applied in the past 3 or 4 years.

If this soil is used for pasture, grazing should be restricted during wet and extremely dry periods. Overgrazing or grazing when the soil is too wet or dry causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is moderately well suited to trees, and some areas still remain in native hardwoods. These areas of hardwoods can be relatively productive if well managed. Good management practices include protection from livestock and fire, group selective cutting, and improved cutting.

This soil is in capability subclass IIs.

353B—Tell silt loam, 2 to 5 percent slopes. This gently sloping, well drained soil is on benches along streams and in uplands. Individual areas are broad and irregular in shape and are usually 30 to 80 acres in size.

Typically, the surface layer is very dark gray, friable silt loam about 4 inches thick. The subsurface layer is grayish brown, friable silt loam about 7 inches thick. The subsoil is about 28 inches thick. The upper part is brown, friable silty clay loam. The middle part is yellowish brown, friable silty clay loam. The lower part is brown, friable loam. The substratum is strong brown, friable loamy sand to a depth of about 60 inches.

This soil has moderate permeability in the surface layer and subsoil and rapid permeability in the substratum. Surface runoff is medium. The available water capacity is moderate. The surface layer is friable and easy to till. The subsoil is generally medium in available phosphorus and very low in available potassium. The surface layer is about 1 1/2 to 2 1/2 percent organic matter.

Most areas of this soil are in cultivated crops or hay, but some are still in woodland. This soil has fair potential for growing cultivated crops, but it has good potential for hay, pasture, and trees. It has fair potential for most engineering uses, but there is a pollution hazard if the soil is used for onsite sewage treatment.

This soil is suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. When this soil is used for cultivated crops, it is subject to erosion. This soil is droughty when rainfall is below normal. Yields depend largely on the amount and timeliness of rainfall. The soil has a tendency to puddle if worked when wet and crust after hard rains. Seedling

development is retarded if crusting occurs prior to emergence. Conservation practices that leave residue on the surface help reduce soil loss, increase the infiltration of water, and conserve moisture. This soil generally has slopes long and smooth enough to be terraced. Channel cuts should be held to a minimum to avoid exposure of coarse material, which is at a depth of 2 to 3 feet. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and reduce crusting. The need for lime in the surface layer varies according to previous liming practices. Generally, this soil needs lime if it has not beed applied in the past 3 or 4 years.

The use of this soil for pasture or hay is effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, increased runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet and very dry periods help keep the pasture and soil in good condition.

This soil is moderately well suited to trees, and some areas still remain in native hardwoods. These areas of hardwoods can be relatively productive if well managed. Good management practices include protection from livestock and fire, group selective cutting, and improved cutting.

This soil is in capability subclass IIIe.

353C—Tell silt loam, 5 to 9 percent slopes. This moderately sloping, well drained soil is on benches along streams and in uplands. Individual areas are short and irregular in shape and are usually 10 to 15 acres in size.

Typically, the surface layer is very dark gray, friable silt loam about 3 inches thick. The subsurface layer is grayish brown, friable silt loam about 7 inches thick. The subsoil is about 28 inches thick. The upper part is brown, friable silty clay loam. The middle part is yellowish brown, friable silty clay loam. The lower part is brown, friable loam. The substratum is strong brown, friable loamy sand to a depth of about 60 inches.

This soil has moderate permeability in the surface layer and subsoil and rapid permeability in the substratum. Surface runoff is medium. The available water capacity is moderate. The surface layer is friable and easy to till. The subsoil is generally medium in available phosphorus and very low in available potassium. The surface layer is about 1 1/2 to 2 1/2 percent organic matter.

Most areas of this soil are in cultivated crops or hay, but some are still in woodland. This soil has poor potential for cultivated crops, but it has fair potential for hay or pasture. It has good potential for trees. It has a fair potential for most engineering uses, but there is a pollution hazard if this soil is used for onsite sewage treatment.

This soil is poorly suited to corn, soybeans, and small grains. It is better suited to grasses and legumes for hay and pasture. When this soil is used for cultivated crops, it is subject to erosion. This soil is droughty when rainfall is below normal. Yields depend largely on the amount and timeliness of rainfall. The soil has a tendency to puddle if worked when wet and to crust after hard rains. Seedling development is retarded if crusting occurs prior to emergence. Conservation practices that leave residue on the surface help reduce soil loss, increase the infiltration of water, and conserve moisture. The soil is suited to terraces, but terracing can be difficult because of short slopes. If terraces are used, channel cuts should be held to a minimum to avoid exposure of coarse material, which is at a depth of 2 to 3 feet. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and reduce crusting. The need for lime in the surface layer varies according to previous liming practices. Generally this soil needs lime if it has not been applied in the past 3 or 4 years.

The use of this soil for pasture or hay is effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, increased runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet and very dry periods help keep the pasture and soil in good condition.

This soil is moderately well suited to trees, and some areas still remain in native hardwoods. These areas of hardwoods can be relatively productive if well managed. Good management practices include protection from livestock and fire, group selective cutting, and improved cutting.

This soil is in capability subclass IIIe.

354—Aquolls, ponded. These very poorly drained soils are in depressions in bottom lands and in some landlocked depressions in uplands. These soils are frequently flooded or ponded for long periods. Individual areas are broad and regular in shape and are usually 10 to 50 acres or more in size.

The surface soil ranges from loam to silty clay loam. It is dark colored and usually about 30 inches thick. The underlying material is gray and highly variable in texture.

Included with these soils in mapping are areas of Palms muck soils, which are high in organic matter. These areas are predominantly in the bottom lands near Goose Lake. Where they occur, these areas make up about 20 percent of the unit.

These soils have moderate permeability. Surface runoff is ponded. The available water capacity is high. Fertility of the subsoil is quite variable. The surface layer is usually high in organic matter.

Most areas of these soils remain covered with water most of the time. These areas usually support a vegetative cover of swampgrass, reeds, cattails, and other water-tolerant plants in marsh.

These soils are not suited to cultivation and provide poor production for pasture. Areas of these soils are better suited to wildlife habitat than to most other uses.

This soil is in capability subclass VIIw.

373E2—Timula silt loam, 12 to 20 percent slopes, moderately eroded. This strongly sloping to steep, well drained soil is in uplands. It is on convex ridgetops and side slopes. Individual areas are irregular in shape and are usually 5 to 20 acres in size.

Typically, the surface layer is about 8 inches of dark grayish brown, friable silt loam mixed with yellowish brown, friable silt loam material from the subsoil. The subsoil is about 18 inches thick. It is yellowish brown, friable silt loam. The substratum is yellowish brown, friable silt loam and a few calcium concretions to a depth of about 60 inches. In some areas calcium concretions are in the surface layer and subsoil.

This soil has moderate permeability. Surface runoff is rapid. The available water capacity is very high. This soil has good tilth. The surface layer is neutral. The subsoil generally is low in available phosphorus and very low in available potassium. The surface layer is less than one-half percent organic matter.

Most areas of this soil are in hay and pasture. The soil has poor potential for cultivated crops, hay, and pasture and fair potential for trees. It has poor potential for most engineering uses.

This soil is poorly suited to cultivated crops. It is better suited to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, it is subject to severe gully and rill erosion. It tends to puddle if worked when wet and to crust after hard rains. Seedling development is retarded if crusting occurs prior to emergence. Contour farming, contour stripcropping, and conservation practices that leave crop residue on the surface help reduce soil losses. Terracing is difficult on this soil because of the steep slopes. Also, terraces are difficult to stabilize because the soil has insufficient clay for adequate compaction. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and maintain good tilth. This soil generally does not need lime in the surface layer.

The use of this soil for pasture or hay is an effective way of controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, increased runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is moderately suited to trees. A vegetative cover should be maintained to reduce erosion. Special equipment might be needed because of the slopes.

This soil is in capabiliy subclass VIe.

377B—Dinsdale silt loam, 2 to 5 percent slopes. This gently sloping, well drained soil is in uplands. It is on slightly convex ridges and long, convex side slopes. Individual areas are broad and irregular in shape and are usually 20 to 100 acres or more in size.

Typically, the surface layer is black, friable silt loam about 7 inches thick. The subsurface layer is very dark brown and very dark grayish brown, friable silty clay loam about 11 inches thick. The subsoil is about 32 inches thick. The upper part is brown, friable silty clay loam. The middle part is dark yellowish brown, friable silty clay loam. The lower part is yellowish brown, friable sandy clay loam and loam. To a depth of about 60 inches, the substratum is yellowish brown, friable loam with grayish brown mottles.

Included with this soil in mapping are a few areas of Kenyon soils. These soils are on lower ridges and side slopes. They formed in loamy material and in the underlying glacial till, which is at a depth of 2 feet. These soils are seepy during wet seasons. Also included are small areas of sandy soils that are scattered throughout the unit. The sandy soils are droughty. These areas make up less than 5 percent of the unit.

This soil is moderately permeable. The upper part of the soil is more permeable than the lower part of the subsoil and substratum. Surface runoff is medium. The available water capacity is high. This soil has good tilth. The subsoil is generally low in available phosphorus and very low in available potassium. The surface layer is about 3 to 4 percent organic matter.

Most areas of this soil are in cultivated crops. This soil has good potential for cultivated crops, hay, pasture, and trees. It has good potential for most engineering uses.

This soil is well suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, it is subject to erosion. It tends to puddle if worked when wet. Contour stripcropping and conservation practices that leave crop residue on the surface help reduce soil loss. In many areas the soil has slopes long and smooth enough to be terraced and farmed on the contour. Cuts for terraces should be held to a minimum to avoid exposure of the less productive subsoil. Returning crop residue to the surface layer or the regular addition of other organic material into the plow layer helps improve fertility and maintain good tilth. The need for lime in the surface layer varies according to previous liming practices. Generally, this soil needs lime if it has not been applied in the past 3 to 5 years.

The use of this soil for pasture or hay is an effective way of controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, increased runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is in capability subclass IIe.

377C—Dinsdale silt loam, 5 to 9 percent slopes. This moderately sloping, well drained soil is in uplands. It is on long, convex side slopes. Individual areas are irregular in shape and are usually 5 to 50 acres in size.

Typically, the surface layer is black, friable silt loam about 7 inches thick. The subsurface layer is very dark

brown and very dark grayish brown, friable silty clay loam about 8 inches thick. The upper part is brown, friable silty clay loam. The middle part is dark yellowish brown, friable silty clay loam. The lower part is yellowish brown, friable sandy clay loam and loam. To a depth of about 60 inches, the substratum is yellowish brown, friable loam with grayish brown mottles.

Included with this soil in mapping are a few areas of Kenyon soils. The Kenyon soils formed in loamy material and in the underlying glacial till, which is at a depth of 2 feet. These soils are seepy during wet seasons. Also included are small areas of sandy soils, which are scattered throughout the unit. These sandy soils are droughty. These areas make up 5 to 10 percent of the unit.

This soil is moderately permeable. The upper part of the soil is more permeable than the lower part of the subsoil and the substratum. Surface runoff is medium. The available water capacity is high. This soil has good tilth. The subsoil is generally low in available phosphorus and very low in available potassium. The surface layer is about 3 to 4 percent organic matter.

Most areas of this soil are in cultivated crops. The soil has good potential for cultivated crops, hay, pasture, and trees. It has good potential for most engineering uses.

This soil is well suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, it is subject to erosion. It tends to puddle if worked when wet. Contour stripcropping and conservation practices that leave crop residue on the surface help reduce soil loss. Many areas have slopes long and smooth enough to be terraced and farmed on the contour. Cuts for terraces should be held to a minimum to avoid exposure of the less productive subsoil. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and maintain good tilth. The need for lime in the surface layer varies according to previous liming practices. Generally, the soil needs lime if it has not been applied in the past 3 to 5 years.

The use of this soil for pasture or hay is an effective way of controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, increased runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is in capability subclass IIIe.

382—Maxfield silty clay loam, 0 to 2 percent slopes. This nearly level, poorly drained soil is in uplands. It is at heads of broad, shallow drainageways. Individual areas are long, broad, and irregular in shape and are usually 20 to 100 acres or more in size.

Typically, the surface layer is black, friable silty clay loam about 8 inches thick. The subsurface layer is black, friable silty clay loam about 11 inches thick. The subsoil is about 27 inches thick. The upper part is dark gray, friable silty clay loam with grayish brown, yellowish brown, and light yellowish brown mottles. The middle part is grayish brown, firm silty clay loam with yellowish brown mottles. The lower part is yellowish brown, firm sandy loam and loam mottled with light brownish gray. To a depth of about 60 inches, the substratum is yellowish brown, firm loam mottled with light gray. In some areas the glacial till is at a depth of 48 inches.

Included with this soil in mapping are areas of somewhat poorly drained Klinger soils on more sloping toe slopes of the uplands. Also included are Sawmill and Colo soils in drainageways where glacial till is deeper than 5 feet. Both Colo and Sawmill soils are subject to run-on water from adjacent soils in uplands. These areas make up between 5 to 10 percent of the unit.

This soil is moderately permeable. The upper part of the soil is more permeable than the lower part of the subsoil and the substratum. Surface runoff is slow. The available water capacity is high. A seasonal high water table is at a depth of 1 foot to 2 feet. This soil has good tilth. Generally, this soil is neutral in the surface layer. The subsoil is generally very low in available phosphorus and potassium. The surface layer is about 6 to 7 percent organic matter.

Most areas of this soil are in cultivated crops. This soil has good potential for cultivated crops, hay, and pasture and fair potential for trees. It has poor potential for most engineering uses.

This soil is well suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. This soil can be used intensively for row crops, but it is wet during spring months. It tends to puddle if worked when wet. Subsurface drains are needed to lower the seasonal high water table, which allows more timely field operations. Areas of this soil not adequately drained are generally used for pasture or hay. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and soil tilth. The soil seldom needs lime in the surface layer because of the neutral reaction.

If this soil is used for pasture, grazing should be restricted during wet periods. Overgrazing or grazing when the soil is too wet causes surface compaction, which results in poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is in capability subclass IIw.

399—Readlyn loam, 1 to 3 percent slopes. This very gently sloping, somewhat poorly drained soil is in glacial uplands. It is in swales and at heads of drainageways. Individual areas are irregular in shape and are usually 5 to 20 acres in size.

Typically, the surface layer is black, friable loam about 7 inches thick. The subsurface layer is black, friable loam about 7 inches thick. The subsoil is about 33 inches thick. The upper part is dark grayish brown and yellowish brown, friable loam mottled with yellowish

brown. The middle part is light olive brown and yellowish brown, friable loam with dark grayish brown and grayish brown mottles. The lower part is yellowish brown, friable loam with olive mottles. To a depth of about 60 inches, the substratum is yellowish brown, friable loam with olive mottles. In some areas the glacial till is at a depth of 30 inches.

Included with this soil in mapping are a few areas of poorly drained soils. These soils are wetter than this Readlyn soil, which can delay farming operations. These areas make up less than 5 percent of the unit.

This soil is moderately permeable. The upper part of the soil is more permeable than the lower part of the subsoil and the substratum. Surface runoff is slow. The available water capacity is high. A seasonal high water table is at a depth of 2 to 4 feet. This soil has good tilth. The subsoil is generally very low in available phosphorus and potassium. The surface is about 4 1/2 to 5 1/2 percent organic matter.

Most areas of this soil are in cultivated crops. The soil has good potential for cultivated crops, hay, and pasture and fair potential for trees. It has fair potential for most engineering uses.

This soil is well suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. It is suitable for intensive row cropping, but it has a seasonal high water table. It tends to puddle if worked when wet. Subsurface drains are beneficial in wet seasons. If properly designed and installed, they allow more timely field operations. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and maintain good tilth. The need for lime in the surface layer varies according to previous liming practices. Generally, the soil needs lime if it has not been applied in the past 3 to 5 years.

When this soil is used for pasture, grazing should be restricted during wet periods. Overgrazing and grazing when the soil is too wet causes surface compaction, which results in poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is in capability class I.

404—Thorp silt loam, 0 to 2 percent slopes. This nearly level, poorly drained soil is in depressional areas on uplands and on loess-covered benches along streams. It formed in 40 to 50 inches of loess and in the underlying sandy material. This soil is subject to occasional flooding. Individual areas are irregular in shape and are usually 20 to 60 acres in size.

Typically, the surface layer is black, friable silty loam about 10 inches thick. The subsurface layer is dark gray and grayish brown, friable silt loam with brown mottles and is about 12 inches thick. The subsoil is about 24 inches thick. The upper part is grayish brown, friable silty clay loam that has very dark gray coatings. The middle part is olive gray, friable silty clay loam mottled with yellowish brown. The lower part is grayish brown, friable silt loam with strong brown mottles. To a depth of about 60 inches, the substratum is grayish brown, very friable, stratified silt loam and sandy loam with strong brown mottles.

This soil has slow permeability. Surface runoff is slow, and water ponds in some areas. The available water capacity is high. A seasonal high water table is at a depth of 0 to 2 feet. This soil has good tilth. Generally, this soil is acid in the surface layer. The subsoil is low in available phosphorus and very low in available potassium. The surface layer is about 2 1/2 to 3 1/2 percent organic matter.

Most areas of this soil are in cultivated crops. The soil has fair potential for cultivated crops, hay, pasture, and trees. It has poor potential for most engineering uses.

This soil is suited to corn, soybeans, and small grains and to grasses for hay and pasture. It tends to puddle if worked when wet. The wetness is caused by flooding, by ponding, and by a seasonal high water table. This soil is suited to intensive use for row crops if adequately drained. A system of subsurface drains or open ditches is needed to lower the water table and reduce ponding. The placement of subsurface drains is difficult in many places because loose, water-bearing sand is at a depth of 4 feet. In some areas plowing this soil mixes part of the subsurface layer into the plow layer, which causes crusting after hard rains. Seedling development is retarded if crusting occurs prior to emergence. Areas of this soil that are not adequately drained are generally left idle or used for hay and pasture. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and soil tilth. Because of the acidity, this soil needs lime if it has not been applied in the past 3 or 4 years.

If this soil is used for pasture, grazing should be restricted during wet periods. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is in capability subclass IIw.

407B—Schley loam, 1 to 4 percent slopes. This very gently sloping, somewhat poorly drained soil is at concave heads of drainageways in uplands and on toe slopes along the drainageways. Individual areas are irregular in shape and are usually 10 to 40 acres in size.

Typically, the surface layer is black, friable loam. It is a plow layer about 9 inches thick. The subsurface layer is dark grayish brown and grayish brown, friable loam with yellowish brown mottles and is about 5 inches thick. The subsoil is about 30 inches thick. The upper part is grayish brown, friable silty clay loam with yellowish brown mottles. The middle part is light brownish gray, friable loam mottled with strong brown. The lower part is mottled light brownish gray and strong brown, friable loamy sand. To a depth of about 60 inches, the

substratum is yellowish brown, firm loam with light grayish brown mottles. In some areas the glacial till is at a depth of 24 to 55 inches.

Included with this soil in mapping are areas where the surface layer is sandy loam or loamy sand, which can be droughty. These areas make up 5 to 10 percent of the unit.

This soil is moderately permeable. The upper part of the soil is more permeable than the substratum. Surface runoff is slow. The available water capacity is high. A seasonal high water table is at a depth of 2 to 4 feet. This soil has good tilth. The subsoil is generally very low in available phosphorus and potassium. The surface layer is about 2 1/2 to 3 1/2 percent organic matter.

Most areas of this soil are in cultivated crops. The soil has good potential for cultivated crops, hay, pasture, and trees. It has poor potential for most engineering uses.

This soil is well suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. It tends to puddle if worked when wet. It can be used intensively for row crops if it is adequately drained. Water and air move through the loamy overburden faster than through the glacial till. The water accumulates at contact with the glacial till, moves laterally, and creates areas of hillside seepage. This wetness limitation can be improved with a subsurface drainage system that intercepts the laterally moving water. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and soil tilth. The need for lime in the surface layer varies according to previous liming practices. Generally, this soil needs lime if it has not been applied in the past 3 or 4 years.

If this soil is used for pasture, grazing should be restricted during wet periods. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is moderately suited to trees. Tree seeds, cuttings, and seedlings survive and grow if competing vegetation is controlled or removed. This can be accomplished by site preparation; by prescribed burning; or by spraying, cutting, or girdling. A seasonal high water table can limit use of equipment.

This soil is in capability subclass IIw.

408B—Olin fine sandy loam, 2 to 5 percent slopes. This gently sloping, well drained soil is in uplands. It is on convex slopes. Individual areas are irregular in shape and are usually 5 to 10 acres in size.

Typically, the surface layer is very dark brown, very friable fine sandy loam about 8 inches thick. The subsurface layer is very dark brown and very dark grayish brown, very friable fine sandy loam about 11 inches thick. The subsoil is about 27 inches thick. The upper part is brown, very friable fine sandy loam. The lower part is yellowish brown, firm loam. The substratum is yellowish brown, firm loam to a depth of about 60 inches.

This soil has moderately rapid permeability in the sandy material and moderate permeability in the underlying glacial till. Surface runoff is medium. The available water capacity is moderate. This soil has good tilth. The subsoil is generally very low in available phosphorus and potassium. The surface layer is about 1 to 2 percent organic matter.

Most areas of this soil are in cultivated crops. This soil has fair potential for cultivated crops, hay, pasture, and trees. It has fair potential for most engineering uses.

This soil is suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, it is subject to wind and water erosion. Later in the growing season, this soil is droughty if rainfall is below normal. Conservation practices that leave crop residue on the surface help reduce soil erosion and conserve moisture. During spring seasons or after heavy rains, this soil can become seepy because water moves laterally over the slowly permeable glacial till at a depth of 2 to 3 feet. These seepy areas can be improved, however, by properly designing and installing a subsurface drainage system to intercept the water. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve soil fertility. The need for lime in the surface layer varies according to previous liming practices. Generally, the soil needs lime if it been has not applied in the past 3 or 4 years.

The use of this soil for pasture or hay is an effective way of controlling erosion. Proper stocking rates; pasture rotation; and timely deferment of grazing, especially during dry periods, help keep the pasture and soil in good condition.

This soil in in capability subclass IIe.

409B—Dickinson fine sandy loam, loam substratum, 2 to 5 percent slopes. This gently sloping, somewhat excessively drained soil is in uplands. It is on convex slopes. It formed in 40 to 60 inches of sandy material and in the underlying glacial till. Individual areas are irregular in shape and are usually 10 to 40 acres in size.

Typically, the surface layer is very dark brown, friable fine sandy loam about 8 inches thick. The subsurface layer is very dark grayish brown, friable fine sandy loam about 11 inches thick. The subsoil is about 36 inches thick. The upper part is brown, friable fine sandy loam. The middle part is dark yellowish brown, friable sandy loam. The lower part is yellowish brown, firm loam. The substratum is yellowish brown, firm loam to a depth of about 60 inches.

This soil has moderately rapid permeability in the sandy material and moderate permeability in the underlying glacial till. Surface runoff is medium. The available water capacity is moderate. This soil has good tilth. The subsoil is generally very low in available

phosphorus and potassium. The surface layer is about 1 to 2 percent organic matter.

Most areas of this soil are in cultivated crops. The soil has fair potential for cultivated crops, hay, pasture, and trees. It has fair potential for most enginering uses.

This soil is suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, it is subject to wind and water erosion. This soil is droughty, but crop yields are good if rainfall is normal and timely. Conservation practices that leave crop residue on the surface help reduce soil erosion and conserve moisture. During spring seasons or after heavy rains, this soil can become seepy because water moves laterally over the slowly permeable glacial till at a depth of 3 to 4 feet. These seepy areas can be improved, however, by properly designing and installing a subsurface drainage system to intercept the water. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve soil fertility. The need for lime in the surface layer varies according to previous liming practices. Generally, the soil needs lime if it has not been applied in the past 3 or 4 years.

The use of this soil for pasture or hay is an effective way of controlling erosion. Proper stocking rates; pasture rotation; and timely deferment of grazing, especially during periods, help keep the pasture and soil in good condition.

This soil is in capability subclass IIe.

412D—Sogn loam, 5 to 14 percent slopes. This moderately sloping to strongly sloping, somewhat excessively drained soil is on convex ridgetops and side slopes in the uplands and on bench-shaped areas. Individual areas are irregular in shape and are usually 5 to 30 acres in size.

Typically, the surface layer is about 11 inches thick. It is very dark brown, friable loam. It is underlain by a layer of very dark grayish brown, friable loam about 2 inches thick. Below this is hard, fractured limestone bedrock.

Included with this soil in mapping are scattered areas where limestone is less than 4 inches beneath the surface or is exposed on the surface as small limestone outcrops or shattered fragments. Also included are a few scattered areas where the limestone is at a depth of 20 to 30 inches below the surface. These areas make up 15 to 20 percent of the unit.

This soil has moderate permeability. Surface runoff is medium. The available water capacity is low. This soil is typically mildly alkaline in the surface layer. The subsoil is very low in available phosphorus and potassium. The surface layer is about 2 1/2 to 3 1/2 percent organic matter.

Most areas of this soil are in hay and pasture. The soil has poor potential for cultivated crops and poor potential for hay, pasture, and trees. It has poor potential for most engineering uses, and there is a pollution hazard if the soil is used for onsite sewage treatment.

This soil is not suited to cultivated crops. It is better suited to grasses for hay and pasture. The soil is subject to erosion if it is cultivated. It also has a very limited root zone and is droughty. Tillage is very difficult because of the shallow depth to bedrock and slabs of limestone on the surface. This soil generally does not need lime.

The use of this soil for pasture or hay is an effective way of controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, excessive runoff, and eventually severe erosion. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet and very dry periods help keep the pasture and soil in good condition.

This soil is in capability subclass VIs.

420—Tama silt loam, benches, 0 to 2 percent slopes. This nearly level, well drained soil is on loess-covered benches above the flood plains. Individual areas are long and irregular in shape and are usually 10 to 20 acres in size.

Typically, the surface layer is very dark brown, friable silt loam about 8 inches thick. The subsurface layer is very dark grayish brown, friable silty clay loam abut 11 inches thick. The subsoil is about 25 inches thick. The upper part is brown, friable silty clay loam that has dark brown coatings. The middle part is brown, friable silty clay loam. The lower part is brown, friable silty clay loam with dark yellowish brown mottles. The substratum is dark yellowish brown, friable silty clay loam to a depth of about 60 inches. Coarse sand is at depth of 7 or 8 feet.

Included with this soil in mapping are a few small areas of somewhat poorly drained Muscatine and Atterberry soils. These soils are in shallow depressions or swales and are wet in the spring. These areas make up less than 5 percent of the unit.

This soil has moderate permeability. Surface runoff is slow. The available water capacity is high. This soil has good tilth. The subsoil is medium in available phosphorus and very low in available potassium. The surface layer is about 3 to 4 percent organic matter.

Most areas of this soil are in cultivated crops. This soil has good potential for cultivated crops, hay, pasture, and trees. It has good potential for most engineering uses.

This soil is well suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. In some areas conservation practices are needed on soils upslope to reduce runoff and siltation onto this soil. This soil tends to puddle if worked when wet. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and maintain good tilth. The need for lime in the surface layer varies according to previous liming practices. Generally, this soil needs lime if it has not been appled in the past 3 to 5 years.

If this soil is used for pasture, grazing should be restricted during wet periods. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and

timely deferment of grazing help keep the pasture and soil in good condition.

This soil is in capability class I.

420B—Tama silt loam, benches, 2 to 5 percent slopes. This gently sloping, well drained soil is on loess-covered benches above the flood plains. Slopes are convex. Individual areas are irregular in shape and are usually 5 to 40 acres in size.

Typically, the surface layer is very dark brown, friable silt loam and is about 8 inches thick. The subsurface layer is very dark grayish brown, friable silty clay loam about 11 inches thick. The subsoil is about 25 inches thick. The upper part is brown, friable silty clay loam that has dark grayish brown coatings. The middle part is brown, friable silty clay loam. The lower part is brown, friable silty clay loam mottled with yellowish brown. The substratum is dark yellowish brown, friable silty clay loam to a depth of about 60 inches. In some places coarse sand is at depth of 6 or 7 feet.

This soil has moderate permeability. Surface runoff is medium. The available water capacity is high. The soil has good tilth. The subsoil is medium in available phosphorus and very low in available potassium. The surface layer is about 3 to 4 percent organic matter.

Most areas of this soil are in cultivated crops. The soil has good potential for cultivated crops, hay, pasture, and trees. It has good potential for most engineering uses.

This soil is well suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. It can be used for intensive row crops, but it is subject to erosion when cultivated. It tends to puddle if worked when wet. Contour farming or conservation practices that leave crop residue on the surface reduce soil loss. In some areas terracing can be difficult because slopes are relatively short. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and maintain good tilth. The need for lime in the surface layer varies according to previous liming practices. Generally, the soil needs lime if it has not been applied in the past 3 to 5 years.

The use of this soil for pasture or hay is effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, increased runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is in capability subclass IIe.

426B—Aredale loam, 2 to 5 percent slopes. This gently sloping, well drained soil is in uplands. It is on convex ridges and side slopes. Individual areas are irregular in shape and are usually 10 to 40 acres in size.

Typically, the surface layer is black, friable loam about 7 inches thick. The subsurface layer is very dark grayish brown, friable loam about 10 inches thick. The subsoil is about 43 inches thick. The upper part is brown, friable loam. The middle part is dark yellowish brown and yellowish brown, friable loam. The lower part is yellowish brown, firm loam.

Included with this soil in mapping are a few small areas of soils that have a sandy surface layer. These soils are droughty. They are on convex knolls and downslope shoulders. These areas make up 5 to 10 percent of the unit.

This soil is moderately permeable. The upper part of the subsoil is more permeable than the lower part of the subsoil. Surface runoff is medium. The available water capacity is high. The surface layer is friable and easy to till. The subsoil is generally very low in available phosphorus and potassium. The surface layer is about 3 to 4 percent organic matter.

Most areas of this soil are in cultivated crops and hay. The soil has good potential for cultivated crops, hay, pasture, and trees. It has fair potential for most engineering uses.

This soil is well suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, it is subject to erosion. It tends to puddle if worked when wet. Contour stripcropping and conservation practices that leave crop residue on the surface help reduce soil loss. Many areas have slopes long and smooth enough to be terraced and farmed on the contour. Cuts for terraces should be held to a minimum to avoid exposure of the less productive subsoil. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility, maintain good tilth, and increase infiltration of water. The need for lime in the surface layer varies according to previous liming practices. Generally, this soil needs lime if it has not been applied in the past 3 to 5 years.

The use of this soil for pasture or hay is an effective way of controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, increased runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is in capability subclass IIe.

428B—Ely silt loam, 2 to 5 percent slopes. This gently sloping, somewhat poorly drained soil is on slightly concave slopes and alluvial fans at the foot of loess-covered hillsides. Individual areas are long, narrow, and irregular in shape and usually 10 to 40 acres in size.

Typically, the surface layer is very dark brown, friable silt loam abut 9 inches thick. The subsurface layer is black and very dark gray, friable silty clay loam abut 17 inches thick. The subsoil is about 34 inches thick. The upper part is very dark grayish brown, friable silty clay loam. The middle part is olive brown, mottled grayish brown, and light olive brown silty clay loam that is friable. It is mottled also with yellowish brown and strong brown. The lower part is very dark grayish brown, friable silty clay loam with strong brown mottles.

This soil has moderate permeability. Surface runoff is medium. The available water capacity is very high. A seasonal high water table is at a depth of 2 to 4 feet. This soil has good tilth. The subsoil is generally very low in available phosphorus and potassium. The surface layer is about 5 to 6 percent organic matter.

Most areas of this soil are in cultivated crops. This soil has good potential for cultivated crops, hay, pasture, and trees. It has fair potential for most engineering uses.

This soil is well suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. Seepage from the uplands often keeps this soil wet. This soil tends to puddle if worked when wet. Subsurface drains are needed in most places. In some areas runoff from higher, eroding, more sloping soils creates siltation that can hamper crop production. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve soil fertility and maintain good tilth. The need for lime in the surface layer varies according to previous liming practices. Generally, this soil needs lime if it has not been applied in the past 3 to 5 years.

If this soil is used for pasture, grazing should be restricted during wet periods. Overgrazing or grazing when the soil is too wet causes surface compaction, increased runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is capability subclass IIe.

462—Downs silt loam, benches, 0 to 2 percent slopes. This nearly level, well drained soil is on loess-covered benches that are along streams and above the flood plain. Individual areas are narrow and irregular in shape and are usually 5 to 15 acres in size.

Typically, the surface layer is very dark brown, friable silt loam about 8 inches thick. The subsurface layer is brown, friable silt loam about 4 inches thick. The subsoil is about 42 inches thick. The upper part is brown, friable silty clay loam. The middle part is dark yellowish brown, friable silty clay loam. The lower part is yellowish brown, friable silty clay loam. To a depth of about 60 inches, the substratum is yellowish brown, friable silt loam with grayish brown mottles. In places coarse sand is at depth of 7 to 8 feet.

Included with this soil in mapping are a few small areas of Fayette soils on benches. These soils formed under trees and are near major rivers and streams. They are lower in organic matter than this Downs soil. These areas make up 10 to 15 percent of the unit.

This soil has moderate permeability. Surface runoff is slow. The available water capacity is high. This soil has good tilth. Generally, this soil is acid in the surface layer. The subsoil is medum in available phosphorus and very low in available potassium. The surface layer is about 2 to 3 percent organic matter.

Most areas of this soil are in cultivated crops, hay, and pasture. It has good potential for cultivated crops, hay, pasture, and trees. It has good potential for most engineering uses.

This soil is well suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. This soil tends to puddle if worked when wet. In some areas conservation practices are needed on soils upslope to reduce runoff and siltation onto this soil. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps to improve fertility and maintain good tilth. Because of the acidity, this soil needs lime if it has not been applied in the past 3 or 4 years.

The use of this soil for pasture or hay is effective in controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is well suited to trees. Tree seeds, cuttings, and seedlings survive and grow well if competing vegetation is controlled or removed. This can be accomplished by site preparation; by prescribed burning; or by spraying, cutting, or girdling.

This soil is in capability class I.

462B—Downs silt loam, benches, 2 to 5 percent slopes. This gently sloping, well drained soil is on loess-covered benches that are along streams and are above the flood plains. Slopes are convex. Individual areas are irregular in shape and are usually 10 to 20 acres in size.

Typically, the surface layer is very dark brown, friable silt loam abut 8 inches thick. The subsurface layer is brown, friable silt loam about 4 inches thick. The subsoil is about 42 inches thick. The upper part is brown, friable silty clay loam. The middle part is dark yellowish brown, friable silty clay loam. The lower part is yellowish brown, friable silty clay loam. To a depth of about 60 inches, the substratum is yellowish brown, friable silt loam with grayish brown mottles. In places coarse sand is at a depth of 6 or 7 feet.

This soil has moderate permeability. Surface runoff is medium. The available water capacity is high. This soil has good tilth. Generally, this soil is acid in the surface layer. The subsoil is medium in available phosphorus and very low in available potassium. The surface layer is about 2 to 3 percent organic matter.

Most areas of this soil are in cultivated crops, hay, and pasture. This soil has good potential for cultivated crops, hay, pasture, and trees. It has good potential for most engineering uses.

This soil is well suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. This soil is suited to intensive row crops, but it is subject to erosion when cultivated. It tends to puddle if worked when wet. Contour stripcropping or conservation practices that leave crop residue on the surface reduce soil loss. Generally, slopes are uniform enough to be terraced and farmed on the contour. In some places,

however, terracing can be difficult to install because the length of slope is relatively short. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and maintain good tilth. Because of the acidity, this soil needs lime if it has not been applied in the past 3 or 4 years.

The use of this soil for pasture or hay is effective in controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, increased runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is well suited to trees. Tree seeds, cuttings, and seedlings survive and grow well if competing vegetation is controlled or removed. This can be accomplished by site preparation; by prescribed burning; or by spraying, cutting, or girdling.

This soil is in capability subclass IIe.

462C—Downs silt loam, benches, 5 to 9 percent slopes. This moderately sloping, well drained soil is on loess-covered benches along streams. Slopes are convex. Individual areas are long, narrow, and irregular in shape and are usually 2 to 25 acres in size.

Typically, the surface layer is very dark brown, friable silt loam. It is a plow layer about 8 inches thick. The subsoil is about 42 thick. The upper part is brown, friable silty clay loam. The middle part is dark yellowish brown, friable silty clay loam. The lower part is yellowish brown, friable silty clay loam. To a depth of about 60 inches, the substratum is yellowish brown, friable silt loam with grayish brown mottles. In places coarse sand is at a depth of 5 or 6 feet.

Included with this soil in mapping are a few areas of Fayette soils on benches. These soils formed under trees and are near major rivers and streams. They are lower in organic matter than this Downs soil. Also included are a few areas of Tama soils on benches. The Tama soils formed under prairie grasses and are higher in organic matter. These areas make up 15 to 18 percent of the unit.

This soil has moderate permeability. Surface runoff is medium. The available water capacity is high. This soil has good tilth. Generally, this soil is acid in the surface layer. The subsoil is medium in available phosphorus and very low in available potassium. The surface layer is about 2 to 3 percent organic matter.

Most areas of this soil are in cultivated crops, hay, and pasture. This soil has good potential for cultivated crops, hay, pasture, and trees. It has fair potential for most engineering uses.

This soil is well suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, it is subject to erosion. It tends to puddle if worked when wet. Contour stripcropping and conservation practices that leave crop residue on the surface reduce soil loss. This soil is suited to terraces; however, terracing can be difficult because of short slopes. Returning crop residue to the surface or the regular addition of other organic material into the plow layer also helps improve fertility and maintain good tilth. Because of the acidity, this soil needs lime if it has not been applied in the past 3 or 4 years.

The use of this soil for pasture or hay is effective in controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, increased runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is well suited to trees. Tree seeds, cuttings, and seedlings survive and grow well if competing vegetation is controlled or removed. This can be accomplished by site preparation; by prescribed burning; or by spraying, cutting, or girdling.

This soil is in capability subclass IIIe.

463B—Fayette silt loam, benches, 2 to 5 percent slopes. This gently sloping, well drained soil is on loess-covered benches above small streams. Slopes are convex. Individual areas are irregular in shape and are usually 5 to 10 acres in size.

Typically, the surface layer is very dark grayish brown and dark grayish brown, friable silt loam. It is a plow layer about 8 inches thick. The subsoil is about 40 inches thick. It is yellowish brown, friable silt loam. In places coarse sand and gravel is at a depth of 6 to 7 feet.

This soil has moderate permeability. Surface runoff is medium. The available water capacity is high. Generally, this soil has good tilth. It is typically acid in the surface layer. The subsoil is high in available phosphorus and very low in available potassium. The surface layer is about 1 to 2 percent organic matter.

Most areas of this soil are in cultivated crops. The soil has good potential for cultivated crops, hay, pasture, and trees. It has fair potential for most engineering uses.

This soil is well suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, it is subject to erosion. Conservation practices that leave crop residue on the surface reduce soil loss. Generally, slopes are uniform enough to be terraced and farmed on the contour. In some places terracing can be difficult because length of slope is relatively short. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility, reduce crusting, and increase water infiltration. Because of the acidity, this soil needs lime if it has not been applied in the past 3 or 4 years.

The use of this soil for pasture or hay is effective in controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction,

increased runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is well suited to trees. Tree seeds, cuttings, and seedlings survive and grow well if competing vegetation is controlled or removed. This can be accomplished by site preparation; by prescribed burning; or by spraying, cutting, or girdling.

This soil is in capbaility subclass IIe.

478G—Rock outcrop-Nordness complex, 18 to 60 percent slopes. This map unit consists of steep and very steep, well drained Nordness soils and outcrops of limestone bedrock. Areas of this map unit are on convex side slopes between the loess-covered uplands and the stream bottoms. Many areas extend along drainageways in the uplands. The rock outcrop and Nordness soils are so intricately intermixed that it is impractical to separate them in mapping. This complex consists of about 45 percent rock outcrops and about 45 percent Nordness soils. Individual areas are long, narrow, and irregular in shape and are usually 50 to 150 acres in size.

The rock outcrop part of the complex consists of hard, exposed limestone that is fractured in most places.

Typically, the Nordness soil has a surface layer of very dark grayish brown, friable silt loam that is about 2 inches thick. The subsurface layer is brown, friable silt loam about 3 inches thick. The subsoil is about 8 inches thick. The upper part is dark yellowish brown, firm silty clay loam. The lower part is yellowish red, firm clay loam. Below this is hard, fractured limestone bedrock. In some areas the surface layer is loam.

Included in mapping are a few scattered areas of soils that consist of 20 to 30 inches of silty material over bedrock. Also included are a few areas of colluvial fragments and chunks of limestone. These areas make up 5 to 10 percent of the unit.

The Nordness soil has moderate permeability. A thin layer above the limestone bedrock has slow permeability. Surface runoff is rapid. The available water capacity is low. This soil is neutral to medium acid in the surface layer. The subsoil is very low in available phosphorus and potassium. The surface layer contains about 1 to 2 percent organic matter.

Most areas of this map unit are in woodland. Many areas are fenced with surrounding soils and are used as pasture. This complex has poor potential for cultivated crops, hay, pasture, and trees. It has poor potential for most engineering uses.

This complex is not suited to cultivated crops and hay. It is poorly suited to pasture. It is best left in timber. The areas of soil between the rock outcrops provide a very limited root zone and are very droughty. If this complex is used for pasture, forage yields and proper stocking rates are very low.

This complex is poorly suited to trees. Most areas remain in native timber, primarily because they are not suited to cultivated crops and produce very low pasture yields. Growth of trees is slow because of the very limited supply of water. Seedling mortality is a severe limitation. Supplemental water might be needed to reduce seedling mortality. These areas can provide relatively productive timber crops if good management practices are used. Such practices include selective cutting and protection from livestock and fire. These areas can also provide suitable habitat for wildlife.

This complex is in capability subclass VIIs.

499D—Nordness silt loam, 5 to 14 percent slopes. This moderately to strongly sloping, well drained soil is downslope from loess-covered uplands. It is on convex ridgetops and side slopes. Individual areas are narrow and irregular in shape and are usually 5 to 15 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 4 inches thick. The subsurface layer is brown, friable silt loam about 3 inches thick. The subsoil is about 8 inches thick. The upper part is dark yellowish brown, firm silty clay loam. The lower part is yellowish red, firm clay loam. Below this is hard fractured limestone bedrock. In some areas the surface layer is loam.

Included with this soil in mapping are scattered areas of soils where limestone is less than 8 inches below the surface or is exposed on the surface as small outcrops or shattered fragments. Also included are a few scattered areas of soils where the limestone is at a depth of 24 inches below the surface. These areas make up 15 to 20 percent of the unit.

This soil has moderate permeability. A thin layer above the limestone bedrock has slow permeability. Surface runoff is medium. The available water capacity is low. This soil is neutral to medium acid in the surface layer. The subsoil is very low in available phosphorus and potassium. The surface layer is about 1 to 2 percent organic matter.

Most areas of this soil are in pasture and woodland. This soil has poor potential for cultivated crops, hay, pasture, and trees. It has poor potential for most engineering uses.

This soil is not suited to cultivated crops. It is better suited to grasses for hay and pasture. This soil is subject to erosion if it is cultivated. It also has a very limited root zone and is droughty. Tillage is very difficult because of the shallow depth to bedrock and the slabs of limestone on the surface.

The use of this soil for pasture or hay is an effective way of controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, excessive runoff, and eventually severe erosion. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet and very dry periods help keep the pasture and soil in good condition. Because of the acidity, this soil needs lime if it has not been applied in the past 3 to 5 years.

This soil is poorly suited to trees. Some areas remain in native timber, primarily because this soil usually produces low pasture yields and is not suited to cultivated crops. Growth of trees is slow because of the limited supply of available water. Seedling mortality is a severe limitation. Supplemental water is needed. Planting seedlings by machine is not practical because the soil is shallow to limestone bedrock. Timber is relatively productive if good management practices are used. Such practices include selective cutting and protection from livestock and fire. These areas can also provide suitable habitat for wildlife.

This soil is in capability subclass VIs.

499F—Nordness silt loam, 14 to 25 percent slopes. This moderately steep to steep, well drained soil is downslope from loess-covered uplands. It is on convex side slopes. Individual areas are irregular in shape and are usually 5 to 30 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 2 inches thick. The subsurface layer is brown, friable silt loam about 3 inches thick. The subsoil is about 8 inches thick. The upper part is dark yellowish brown, firm silty clay loam. The lower part is yellowish red, firm clay loam. Below this is hard, fractured limestone bedrock. In some areas the surface layer is loam.

Included with this soil in mapping are scattered areas of soil where limestone is less than 8 inches below the surface or is exposed on the surface as small outcrops or shattered fragments. Also included are a few scattered areas of soils where the limestone is at a depth of 20 to 30 inches below the surface. These areas make up about 5 percent of the unit.

This soil has moderate permeability. A thin layer above the limestone bedrock has slow permeability. Surface runoff is rapid. The available water capacity is low. This soil is neutral to medium acid in the surface layer. The subsoil is very low in available phosphorus and potassium. The surface layer is about 1 to 2 percent organic matter.

Most areas of this soil are in pasture or woodland (fig. 9). This soil has poor potential for cultivated crops, hay, pasture, and trees. It has poor potential for most engineering uses.

This soil is not suited to cultivated crops. It is better suited to trees or to grasses for pasture. This soil is subject to severe erosion if it is not protected with a stand of vegetation. It also has a very limited root zone and is droughty. If this soil is used for hay, harvesting is difficult because of the outcropping of limestone and steepness of slope.

The use of this soil for pasture is an effective way of controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, excessive runoff, and eventually severe erosion. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet and very dry periods help keep the pasture and soil in good condition. Because of the acidity, this soil needs lime if it has not been applied in the past 3 to 5 years.

This soil is poorly suited to trees. Many areas remain in native timber, primarily because this soil usually produces low pasture yields and is not suited to cultivated crops. Growth of trees is slow because of the limited supply of available water. Seedling mortality is a severe limitation. Supplemental water is needed. Planting seedlings by machine is not practical because the soil is shallow to limestone bedrock. Special equipment might be needed because of steep slopes. Timber is relatively productive if good management practices are used. Such practices include selective cutting and protection from livestock and fire. These areas can also provide suitable habitat for wildlife.

This soil is in capability subclass VIIs.

591B—Clyde-Schley complex, 1 to 4 percent slopes. These nearly level and gently sloping, poorly drained and somewhat poorly drained soils are in glacial uplands. They are in drainageways. The Clyde soils are subject to frequent flooding. They make up about 50 percent of this unit and are in the lowest part of the drainageway. The Schley soils, about 30 percent of the unit, are at the head of the drainageway and in a narrow band, at a somewhat higher level, which surrounds the Clyde soils. Individual areas are long and irregular in shape and usually 20 to 50 acres in size.

Typically, the Clyde soil has a surface layer of black, friable silty clay loam abut 7 inches thick. A subsurface layer is also black, friable silty clay loam about 11 inches thick. The subsoil is about 42 inches thick. The upper part is grayish brown, friable loam mottled with yellowish brown. The middle part is gray and light gray, friable loam and clay loam with yellowish brown mottles. The lower part is mottled light olive gray and brownish yellow, firm loam.

Typically, the Schley soil has a plow layer of black, friable loam about 9 inches thick. The subsurface layer is dark grayish brown and grayish brown, friable loam mottled with yellowish brown and is about 5 inches thick. The subsoil is about 30 inches thick. The upper part is grayish brown, friable silt loam and silty clay loam with yellowish brown mottles. The middle part is light brownish gray, friable loam with strong brown mottles. The lower part is mottled light brownish gray and strong brown, friable loamy sand. To a depth of about 60 inches, the substratum is yellowish brown, firm loam mottled with light grayish brown.

Included with these soils in mapping are areas of somewhat poorly drained soils that have a thicker, dark surface layer than that of the Clyde and Schley soils. These included soils are located at somewhat higher levels above the lower parts of the drainageway. They are higher in organic matter than the major soils. These areas make up 5 to 10 percent of the unit.

The Clyde soil is moderately permeable. The upper part of the soil is more permeable than the lower part of

the subsoil. Surface runoff is slow. The available water capacity is very high. A seasonal high water table is at a depth of 1 foot to 2 1/2 feet. This soil has good tilth. Generally, this soil has neutral reaction throughout. The subsoil is generally very low in available phosphorus and potassium. The surface layer is about 7 to 11 percent organic matter.

The Schley soil is moderately permeable. The upper part of the soil is more permeable than the substratum. Surface runoff is slow. The available water capacity is high. A seasonal high water table is at a depth of 2 to 4 feet. This soil has good tilth. The subsoil is generally very low in available phosphorus and potassium. The surface layer is about 2 1/2 to 3 1/2 percent organic matter.

Most areas of this map unit are cultivated. These soils have good potential for cultivated crops, hay, and pasture and fair potential for trees. They have poor potential for most engineering uses.

The soils in this map unit are well suited to corn, soybeans, and small grains and to grasses for hay and pasture. These soils tend to puddle if worked when wet. They are subject to seepage and runoff from adjacent, more sloping soils. Subsurface drains lower the water table and allow for more timely field operations. Conservation practices used on soils upslope reduce runoff and siltation onto these soils. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and maintain soil tilth. The addition of lime is seldom needed in the Clyde soil, but the need for lime in the Schley soil varies according to previous liming practices. Generally, the Schley soil needs lime if it has not been applied in the past 3 or 4 years.

Areas of this map unit that are not adequately drained are generally used for pasture. If these soils are used for pasture, grazing should be restricted during wet periods.

Figure 9.—Nordness silt loam, 14 to 25 percent slopes, is used primarily for pasture because tilling with farm machinery is difficult. This soil is commonly adjacent to bottom lands along major streams.

Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

The Schley soil is moderately suited to trees if competing vegetation is controlled or removed. This can be accomplished by site preparation; by prescribed burning; or by spraying, cutting, or girdling. This soil has a seasonal high water table, and use of equipment can be limited.

This complex is in capability subclass IIw.

662C2—Mt. Carroll silt loam, 5 to 9 percent slopes, moderately eroded. This moderately sloping, well drained soil is in uplands. It is on convex ridgetops. Individual areas are narrow and irregular in shape and are usually 5 to 20 acres in size.

Typically, the surface layer is about 8 inches of very dark grayish brown, friable silt loam mixed with brown, friable silt loam material from the subsoil. The subsoil is about 33 inches thick. It is brown, friable silt loam. The substratum is yellowish brown, friable silt loam to a depth of about 60 inches.

Included with this soil in mapping are areas of soils that formed under forest vegetation. These areas, near major streams and rivers, have a higher level of available phosphorus than the Mt. Carroll soil but a lower level of organic matter.

This soil has moderate permeability. Surface runoff is medium. The available water capacity is very high. This soil has good tilth. Generally, the surface layer is acid. The subsoil generally has a medium level of available phosphorus, and it is very low in available potassium. The surface layer is about 1 to 2 percent organic matter.

Most areas of this soil are in cultivated crops, hay, and pasture. This soil has potential for cultivated crops, hay, pasture, and trees. It has good potential for most enineering uses.

This soil is well suited to corn and small grains and to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, it is subject to severe erosion. It tends to puddle if worked when wet and to crust after hard rains. Seedling development is retarded if crusting occurs prior to emergence. Contouring, terracing, contour stripcropping, and conservation practices that leave crop residue on the surface help reduce soil loss. Terracing can be difficult on this soil. The soil is difficult to stabilize because it has insufficient clay for adequate compaction. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and maintain good tilth. The need for lime in the surface layer varies according to previous liming practices. Because of the acidity, this soil needs lime if it has not been applied in the past 3 or 4 years.

The use of this soil for pasture or hay is an effective way of controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, increased runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is well suited to trees. Tree seeds, cuttings, and seedlings survive and grow if competing vegetation is controlled or removed. This can be accomplished by site preparation; by prescribed burning; or by spraying, cutting, or girdling.

This soil is in capability subclass IIIe.

662D2—Mt. Carroll silt loam, 9 to 14 percent slopes, moderately eroded. This strongly sloping, well drained soil is in uplands. It is on convex ridgetops and side slopes. Individual areas are narrow and irregular in shape and are usually 10 to 40 acres in size.

Typically, the surface layer is about 8 inches of very dark grayish brown, friable silt loam mixed with brown, friable silt loam material from the subsoil. The subsoil is about 33 inches thick. It is brown, friable silt loam. The substratum is yellowish brown, friable silt loam to a depth of about 60 inches.

Included with this soil in mapping are areas of soils that formed under forest vegetation. These soils, near major streams and rivers, have a higher level of available phosphorus, but they are lower in organic matter.

This soil has moderate permeability. Surface runoff is medium. The available water capacity is very high. This soil has good tilth. Generally, the surface layer is acid. The subsoil generally has a medium level of available phosphorus and is very low in available potassium. The surface layer is about 1 to 2 percent organic matter.

Most areas of this soil are in cultivated crops, hay, and pasture. This soil has fair potential for cultivated crops, hay, pasture, and trees. It has fair potential for most engineering uses.

This soil is suited to corn and small grains and to grasses and legumes for hay and pasture. If the soil is used for cultivated crops, it is subject to severe erosion. It tends to puddle if worked when wet and crust after hard rains. Seedling development is retarded if crusting occurs prior to emergence. Contouring, terracing, contour stripcropping, and conservation practices that leave crop residue on the surface help reduce soil loss. This soil can be terraced; however, it is difficult to stabilize because there is insufficient clay for adequate compaction. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and maintain good tilth. The need for lime in the surface layer varies according to previous liming practices. Because of the acidity, this soil needs lime if it has not been applied in the past 3 or 4 years.

The use of this soil for pasture or hay is an effective way of controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, increased runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and

restricted use during wet periods help keep the pasture and soil in good condition.

This soil is well suited to trees. Tree seeds, cuttings, and seedlings survive and grow if competing vegetation is controlled or removed. This can be accomplished by site preparation; by prescribed burning; or by spraying, cutting, or girdling.

This soil is in capability subclass IIIe.

662E2—Mt. Carroll silt loam, 14 to 18 percent slopes, moderately eroded. This moderately steep, well drained soil is in uplands. It is on convex ridgetops and side slopes. Individual areas are narrow and irregular in shape and are usually 10 to 50 acres in size.

Typically, the surface layer is about 7 inches of very dark grayish brown, friable silt loam mixed with brown, friable silt loam material from the subsoil. The subsoil is about 31 inches thick. It is brown, friable silt loam. The substratum, to a depth of about 60 inches, is yellowish brown, friable silt loam.

Included with this soil in mapping are areas of soils that formed under forest vegetation. These soils, near major streams and rivers, have a higher level of available phosphorus, but they are lower in organic matter.

This soil has moderate permeability. Surface runoff is medium. The available water capacity is very high. This soil has good tilth. Generally, the surface layer is acid. The subsoil generally has a medium level of available phosphorus and is very low in available potassium. The surface layer is about 1/2 to 1 1/2 percent organic matter.

Most areas of this soil are in cultivated crops, hay, and pasture. This soil has fair potential for cultivated crops, hay, pasture, and trees. It has poor potential for most engineering uses.

This soil is suited to corn and small grains and to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, it is subject to severe erosion. It tends to puddle if worked when wet and to crust after hard rains. Seedling development is retarded if crusting occurs prior to emergence. Contour farming, contour stripcropping, and conservation practices that leave crop residue on the surface help reduce soil loss. Terracing is difficult on this soil because of the short, moderately steep slopes. Also, this soil is difficult to stabilize for terraces because there is insufficient clay for adequate compaction. Returning crop residue to the surface or the regular addition of other organic material into the plow layer also helps improve fertility and maintain good tilth. The need for lime in the surface layer varies according to previous liming practices. Because of acidity, this soil needs lime if it has not been applied in the past 3 or 4 years.

The use of this soil for pasture or hay is an effective way of controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, increased runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is moderately well suited to trees. Tree seeds, cuttings, and seedlings survive and grow if competing vegetation is controlled or removed. This can be accomplished by site preparation; by prescribed burning; or by spraying, cutting, or girdling. There is a moderate hazard of erosion, and use of equipment can be limited by the steep slopes. A plant cover should be maintained to reduce erosion.

This soil is in capability subclass IVe.

688—Koszta silt loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on benches adjacent to major streams and rivers. This soil is subject to rare flooding. Some areas are occasionally flooded. Individual areas are broad and irregular in shape and usually 10 to 50 acres in size.

Typically, the surface layer is black, friable silt loam. It is a plow layer about 7 inches thick. The subsurface layer is grayish brown, friable silt loam about 2 inches thick. The subsoil is about 36 inches thick. The upper part is dark grayish brown, friable silt loam with yellowish brown mottles. The middle part is dark grayish brown, firm silty clay loam mottled with grayish brown and yellowish brown. The lower part is dark grayish brown, friable silty clay loam with yellowish brown mottles. To a depth of about 60 inches, the substratum is dark grayish brown, friable silt loam with yellowish brown mottles.

Included with this soil in mapping are a few areas of soils, in lower-lying swales, which are poorly drained. Field operations can be delayed during wet years. These areas make up less than 5 percent of the unit.

This soil has moderate permeability. Surface runoff is slow. The available water capacity is high. A seasonal high water table is at a depth of 2 to 3 feet. This soil has good tilth. The subsoil is generally low in available phosphorus and very low in available potassium. The surface layer is about 2 to 3 percent organic matter.

Most areas of this soil are in cultivated crops. The soil has good potential for cultivated crops, hay, pasture, and trees. It has poor potential for most engineering uses.

This soil is well suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. It tends to puddle if worked when wet. Subsurface drains are beneficial in wet years if adequate outlets are available. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and maintain good tilth. The need for lime in the surface layer varies according to previous liming practices. Generally, lime is needed if it has not been applied in the past 3 to 5 years.

If this soil is used for pasture, grazing should be restricted during wet periods. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is moderately well suited to trees. Tree seeds, cuttings, and seedlings survive and grow if competing vegetation is controlled or removed. This can be accomplished by site preparation; by prescribed burning; or by spraying, cutting, or girdling.

This soil is capability class I.

727—Udolpho loam, 32 to 40 inches to sand and gravel, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on benches along streams and in drainageways of uplands. The drainageways lack well-defined outlets. Individual areas are broad and irregular in shape and are usually 20 to 100 acres in size.

Typically, the surface layer is very dark gray, friable loam about 9 inches thick. The subsurface layer is grayish brown, friable loam mottled with yellowish brown. It is about 6 inches thick. The subsoil is about 23 inches thick. The upper part is grayish brown, friable loam with yellowish brown mottles. The lower part is grayish brown, friable sandy loam with yellowish brown mottles. To a depth of about 60 inches, the substratum is yellowish brown, loose sand and gravelly sand mottled with brownish gray. In some areas the coarse-textured material can be at a depth of 45 inches.

Included with this soil in mapping are a few areas of soils, in lower-lying swales, that are poorly drained. These soils stay wet longer, which can delay field operations in spring. These areas make up 5 to 10 percent of the unit.

This soil has moderate permeability in the loamy material and rapid permeability in the underlying sand and gravel. Surface runoff is slow. The available water capacity is moderate. A seasonal high water table is at a depth of 1 foot to 3 feet. This soil has good tilth, but it will puddle if worked when wet. The subsoil is generally low in available phosphorus and very low in available potassium. The surface layer contains about 2 to 3 percent organic matter.

Most areas of this soil are in cultivated crops. This soil has fair potential for cultivated crops, hay, pasture, and trees. It has poor potential for most engineering uses, and there is a pollution hazard when used for onsite sewage treatment.

This soil is suited to corn, soybeans, and small grains and to grasses for hay and pasture. It tends to puddle if worked when wet. This soil has a seasonally high water table in the spring. The water table, however, drops rapidly during the growing season. During wet seasons this soil benefits from subsurface drains. Placement of drains is difficult in some areas because loose, water-bearing sand and gravel is below a depth of 3 feet. Returning crop residue to the surface or the regular addition of other organic material into the subsoil helps improve fertility and increase the infiltration of water. The need for lime varies in the surface layer according to previous liming practices. Generally, lime is needed if it has not been applied in the past 3 to 5 years.

If this soil is used for pasture, grazing should be restricted during wet and extremely dry periods. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is moderately well suited to cottonwoods and upland hardwoods, even though few areas have been used for timber. Tree seeds, cuttings, and seedlings survive and grow providing precipitation is normal and timely. Competing vegetation should be controlled or removed by site preparation; by prescribed burning; or by spraying, cutting, or girdling. The use of equipment may be limited by a seasonal high water table.

This soil is in capability subclass IIs.

728—Udolpho loam, 24 to 32 inches to sand and gravel, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on benches along streams and in drainageways of uplands. These drainageways lack well-defined outlets. Individual areas are broad and irregular in shape and are usually 20 to 100 acres in size.

Typically, the surface layer is very dark gray, friable loam about 9 inches thick. The subsurface layer is grayish brown, friable loam with yellowish brown mottles. It is about 6 inches thick. The subsoil is about 23 inches thick. The upper part is grayish brown, friable loam with yellowish brown mottles. The middle part is grayish brown, friable sandy loam mottled with yellowish brown. The lower part is grayish brown, loose loamy sand with yellowish brown mottles. It is 5 to 7 percent fine gravel. To a depth of about 60 inches, the substratum is yellowish brown, loose sand with brownish gray mottles. In some places the coarse-textured material can be at a depth of 20 inches.

Included with this soil in mapping are a few areas of Atterberry soils, sandy substratum. The Atterberry soils, sandy substratum, have more clay in the surface layer and subsoil than the Udolpho soil. These soils are not susceptible to drought as are the Udolpho soils. Also included are a few areas of soils, in lower-lying swales, that are poorly drained. These soils stay wet longer, and, in spring, field operations can be delayed. These areas make up 10 to 15 percent of the unit.

This soil has moderate permeability in the loamy material and rapid permeability in the underlying sand and gravel. Surface runoff is slow. The available water capacity is moderate. A seasonal high water table is at a depth of 1 foot to 3 feet. This soil has good tilth. The subsoil is generally low in available phosphorus and very low in available potassium. The surface layer is about 2 to 3 percent organic matter.

Most areas of this soil are in cultivated crops. The soil has fair potential for cultivated crops, hay, pasture, and trees. It has poor potential for most engineering uses, and there is a pollution hazard if the soil is used for onsite sewage treatment.

This soil is suited to corn, soybeans, and small grains and to grasses for hay and pasture. It puddles if worked when wet. It has a seasonally high water table in the spring. The water table, however, drops rapidly during the growing season. During wet seasons this soil benefits from subsurface drains. Placement of drains is difficult in some areas because loose, water-bearing sand and gravel is below 2 feet. Later in the growing season, this soil can be droughty if rainfall is below normal. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and increase infiltration of water. The need for lime in the surface layer varies according to previous liming practices. Generally, this soil needs lime if it has not been applied in the past 3 to 5 years.

If this soil is used for pasture, grazing should be restricted during wet and very dry periods. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is moderately well suited to cottonwoods and upland hardwoods, even though few areas have been used for timber. Tree seeds, cuttings, and seedlings survive and grow providing precipitation is normal and timely. Competing vegetation should be controlled or removed by site preparation; by prescribed burning; or by spraying, cutting, or girdling. The use of equipment can be limited by a seasonal high water table.

This soil is in capability subclass IIs.

733—Calco silty clay loam, 0 to 2 percent slopes. This nearly level, poorly drained soil is on alluvial flood plains and on low benches along streams. This soil is subject to occasional flooding. Individual areas are broad and irregular in shape and are usually 50 to 100 acres in size.

Typically, the surface layer is black, friable silty clay loam about 8 inches thick. The subsurface layer is black, firm silty clay loam about 11 inches thick. The subsoil is about 25 inches thick. The upper part is very dark gray, firm silty clay loam with brown mottles. The middle part is very dark gray, firm silty clay loam. The lower part is light olive brown, firm silty clay loam mottled with grayish brown. The substratum is gray, friable silty clay loam and grayish brown, loose loamy sand to a depth of about 60 inches.

Included with this soil in mapping are a few scattered areas of Sawmill and Colo soils. Unlike the Calco soils, the Sawmill and Colo soils do not have a high concentration of lime. These areas make up 5 to 10 percent of the unit.

This soil has moderate permeability. Surface runoff is slow. The available water capacity is high. A seasonal high water table is at a depth of 1 foot to 3 feet. This soil has good tilth. This soil is calcareous, and free lime and small fragments of snail shell are present. The high content of calcium carbonate affects the availability of plant nutrients in the soil. The subsoil generally is low in available phosphorus and very low in available potassium. The surface layer is about 5 to 7 percent organic matter.

Most areas of this soil are in culativated crops and hay. A few undrained areas are used for pasture. This soil has good potential for cultivated crops, hay, and pasture. It has fair potential for trees and poor potential for most engineering uses.

This soil is suited to corn, soybeans, and small grains and to grasses for hay and pasture. This soil has a tendency to puddle if worked when wet or crust after heavy rains. Seedling development is retarded if crusting occurs prior to emergence. Cultivation is often delayed unless this poorly drained soil is artificially drained. If adequate outlets are available, subsurface drains work fairly well. Because of flooding it may be difficult to get a good stand of row crops established in some years. This soil contains excessive lime, which affects the availability of many plant nutrients. Chlorosis, or yellowing of plant leaves, generally shows up in soybeans planted on this soil. This indicates a deficiency of iron. Special applications of fertilizer are needed to correct this imbalance. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and maintain good tilth.

If this soil is used for pasture, grazing should be restricted during wet periods. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is in capability subclass IIw.

760—Ansgar silt loam, 0 to 3 percent slopes. This nearly level and very gently sloping, poorly drained soil is in uplands. It is on concave toe slopes and at the heads of drainageways. Individual areas are broad and irregular in shape and are usually 20 to 100 acres or more in size.

Typically, the surface layer is black, friable silt loam about 8 inches thick. The subsurface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsoil is about 33 inches thick. The upper part is grayish brown, friable silt loam mottled with yellowish brown and dark yellowish brown. The middle part is grayish brown, friable silty clay loam mottled with yellowish brown. The lower part is grayish brown, friable loam mottled with yellowish brown. To a depth of about 60 inches, the substratum is grayish brown, friable loam with yellowish brown mottles. In some places the glacial till is at a depth of 48 inches.

Included with this soil in mapping are areas of soils that are somewhat poorly drained. These areas are scattered throughout the unit and make up less than 5 percent of the unit.

This soil is moderately permeable. The upper part of the soil is more permeable than the lower part of the

subsoil and the substratum. Surface runoff is slow. The available water capacity is high. A seasonal high water table is at a depth of 1 foot to 2 feet. The tilth of this soil is good. The subsoil is generally very low in available phosphorus and potassium. The surface layer is about 2 1/2 to 3 1/2 percent organic matter.

Most areas of this soil are in cultivated crops. The soil has good potential for growing cultivated crops, hay, and pasture and fair potential for growing trees. It has poor potential for most engineering uses.

This soil is well suited to corn, soybeans, and small grains and to grasses for hay and pasture. It tends to puddle if worked when wet. Intensive row cropping is possible on this soil if it is drained and properly managed. This soil has a high water table. Subsurface drains are beneficial. They allow more timely field operations. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and maintain good tilth. The need for lime in the surface layer varies according to previous liming practices. Generally, this soil needs lime if it has not been applied in the past 3 or 4 years.

If this soil is used for pasture, grazing should be restricted during wet periods. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is in capability subclass IIw.

777B—Wapsie loam, 2 to 5 percent slopes. This gently sloping, well drained soil is on benches along streams and rivers. It is on convex slopes. Individual areas are irregular in shape and are usually 10 to 30 acres in size.

Typically, the surface layer is very dark grayish brown, friable loam. It is a plow layer about 6 inches thick. The subsurface layer is brown, friable loam about 5 inches thick. The subsoil is about 18 inches thick. The upper part is brown, friable loam. The lower part is brown, friable sandy clay loam and about 10 percent gravel. To a depth of about 60 inches, the substratum is dark yellowish brown and yellowish brown, loose sand and about 10 to 15 percent gravel.

Included with this soil in mapping are a few areas of Lamont soils on somewhat higher positions of the landscape. The Lamont soils have a higher content of sand and are more droughty than this Wapsie soil. Also included are a few scattered areas of soils that formed under forest vegetation. These soils have less organic matter. These areas make up 10 to 15 percent of the unit.

This soil has moderate permeability in the loamy material and very rapid permeability in the underlying, coarse sand and gravel. Surface runoff is medium. The available water capacity is moderate. This soil has good tilth. The subsoil is low in available phosphorus and very low in available potassium. The surface layer is about 1 to 2 percent organic matter.

Most areas of this soil are in cultivated crops, hay, and pasture. This soil has fair potential for cultivated crops, hay, pasture, and trees. It has fair potential for most engineering uses, but there is a pollution hazard if the soil is used for onsite sewage treatment.

This soil is suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, it is subject to wind and water erosion. This soil is droughty, but production of crops is good if rainfall is normal and timely. This soil tends to puddle if worked when wet. Conservation practices that leave crop residue on the surface help reduce soil erosion and conserve moisture (fig. 10). Returning crop residue to the surface or the regular addition of other organic matterial into the plow layer also helps improve fertility and increase the infiltration of water. The need for lime in the surface layer varies according to previous liming practices. Generally, this soil needs lime if it has not been applied in the past 3 to 5 years.

The use of this soil for pasture or hay is an effective way of controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, increased runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is moderately suited to conifers and upland hardwoods. Tree seeds, cuttings, and seedlings survive and grow providing precipitation is normal and timely. Competing vegetation should be controlled or removed by site preparation; by prescribed burning; or by spraying, cutting, or girdling.

This soil is in capability subclass IIe.

777C—Wapsie loam, 5 to 9 percent slopes. This moderately sloping, well drained soil is on benches along streams. Slopes are convex. Individual areas are irregular in shape and are usually 5 to 10 acres in size.

Typically, the surface layer is very dark grayish brown, friable loam. It is a plow layer about 6 inches thick. The subsurface layer is brown, friable loam about 5 inches thick. The subsoil is about 18 inches thick. The upper part is brown, friable loam. The lower part is brown, friable sandy clay loam and about 10 percent gravel. To a depth of about 60 inches, the substratum is dark yellowish brown and yellowish brown, loose sand and about 10 to 15 percent gravel.

Included with this soil in mapping are a few areas of Lamont soils, which are on somewhat higher positions of the landscape. The Lamont soils have a higher content of sand and are more droughty than this Wapsie soil. Also included are a few scattered areas of soils formed under wooded vegetation. These soils have less organic matter. These areas make up 5 to 10 percent of the unit.

This soil has moderately rapid permeability in the loamy material and very rapid permeability in the underlying coarse sand and gravel. Surface runoff is

medium. The available water capacity is moderate. This soil has good tilth. The subsoil is low in available phosphorus and very low in available potassium. The surface layer is about 1 to 2 percent organic matter.

Most areas of this soil are in cultivated crops, hay, and pasture. The soil has poor potential for cultivated crops, hay, pasture, and trees. It has fair potential for most engineering uses, but there is a pollution hazard if the soil is used for onsite sewage treatment.

This soil is poorly suited to corn, soybeans, and small grains. It is better suited to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, it is subject to wind and water erosion. This soil is droughty, and production of all crops is dependent on amount and timeliness of rainfall. The soil tends to puddle if worked when wet. Conservation practices that leave crop residue on the surface help reduce soil erosion and conserve moisture. Returning crop residue to the surface or the regular addition of other organic material into the plow layer also helps improve fertility and increase the infiltration of water. The need for lime in the surface layer varies according to previous liming practices. Generally, this soil needs lime if it has not been applied in the past 3 to 5 years.

The use of this soil for pasture or hay is an effective way of controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, increased runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is moderately suited to conifers and upland hardwoods. Tree seeds, cuttings, and seedlings survive and grow providing precipitation is normal and timely. Competing vegetation should be controlled or removed by site preparation; by prescribed burning; or by spraying, cutting, or girdling.

Figure 10.—Crop residue left on the surface is beneficial on soils that are subject to wind erosion, such as the Wapsie soils. This practice also helps conserve moisture so that more water is made available for plant growth.

This soil is in capability subclass IIIe.

809B—Bertram sandy loam, 2 to 7 percent slopes. This gently sloping and moderately sloping, somewhat excessively drained soil is in uplands. It is on convex ridges and side slopes. Individual areas are irregular in shape and are usually 5 to 20 acres in size.

Typically, the surface layer is very dark brown, very friable sandy loam about 11 inches thick. The subsurface layer is very dark grayish brown, very friable sandy loam about 5 inches thick. The subsoil is about 12 inches thick. It is brown, friable sandy loam. The substratum is light yellowish brown, very friable loamy sand. Hard, fractured limestone bedrock is at a depth of about 33 inches. In some places the surface layer is less than 8 inches thick.

This soil has moderately rapid permeability. Surface runoff is medium. The available water capacity is low. This soil has good tilth. The subsoil is generally very low in available phosphorus and potassium. The surface layer is about 1 to 1 1/2 percent organic matter.

Most areas of this soil are in hay and pasture, but a few are in cultivated crops. This soil has poor potential for cultivated crops but fair potential for hay, pasture, and trees. It has poor potential for most engineering uses, and there is a pollution hazard if the soil is used for onsite sewage treament.

This soil is poorly suited to corn, soybeans, and small grains. It is better suited to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, it is subject to wind and water erosion. This soil is droughty. Conservation practices that leave crop residue on the surface help reduce soil erosion and conserve moisture. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve soil fertility. The need for lime in the surface layer varies according to liming practices of previous years. Generally, this soil needs lime if it has not been applied in the past 3 to 5 years.

The use of this soil for pasture or hay is an effective way of controlling erosion. Proper stocking rates; pasture rotation; and timely deferment of grazing, especially during dry periods, help keep the pasture and soil in good condition.

This soil is in capability subclass IVs.

918—Garwin silty clay loam, sandy substratum, 0 to 2 percent slopes. This nearly level, poorly drained soil is in uplands and on loess-covered benches along streams. It is on concave slopes at heads of drainageways or in slight depressions. This soil formed in 40 to 60 inches of loess and in the underlying sandy material. Individual areas are broad and irregular in shape and are usually 40 to 100 acres or more in size.

Typically, the surface layer is black, friable silty clay loam about 7 inches thick. The subsurface layer is black, friable silty clay loam about 8 inches thick. The subsoil is about 31 inches thick. The upper part is dark gray, friable silty clay loam with light olive brown mottles. The middle part is olive gray, friable silty clay loam mottled with yellowish brown, olive brown, and gray. The lower part is dark gray and yellowish brown, friable sandy loam. The substratum is brownish yellow, loose sand to a depth of about 60 inches. In some places remnants of glacial till are at a depth of 5 feet.

This soil has moderate permeability in the silty material and rapid permeability in the underlying sandy material. Surface runoff is slow. The available water capacity is high. A seasonal high water table is at a depth of 1 foot to 3 feet. This soil has good tilth. The subsoil is low in available phosphorus and very low in available potassium. The surface layer is about 5 1/2 to 6 1/2 percent organic matter.

Most areas of this soil are in cultivated crops. This soil has good potential for cultivated crops, hay, and pasture but fair potential for trees. It has a poor potential for most enginering uses, and there is a pollution hazard if the soil is used for onsite sewage treatment.

This soil is well suited to corn, soybeans, and small grains and to grasses for hay and pasture. This soil is suited to intensive use for row crops, but it is wet during the spring and receives runoff from adjacent slopes. It tends to puddle if worked when wet. Subsurface drains are needed to lower the water table and to allow timely field operations. The installation of drains is difficult in some places because loose, water-bearing sands are at a depth of 4 feet. In some areas conservation practices are also needed on soils upslope to reduce runoff and siltation onto this soil. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and soil tilth. This soil usually does not need lime.

If this soil is used for pasture, grazing should be restricted during wet periods. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is in capability subclass IIw.

919—Muscatine silt loam, sandy substratum, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on uplands and loess-covered benches along streams. This soil formed in 40 to 60 inches of loess and in the underlying sandy material. Individual areas are broad and irregular in shape and are usually 50 to 80 acres in size.

Typically, the surface layer is black, friable silt loam about 8 inches thick. The subsurface layer is black and very dark brown, friable silt loam about 13 inches thick. The subsoil is about 34 inches thick. The upper part is dark grayish brown, friable silty clay loam with dark yellowish brown mottles. The middle part is grayish brown, friable silty clay loam mottled with yellowish brown. The lower part is yellowish brown, very friable sandy loam with brown mottles. To a depth of about 60

inches, the substratum is yellowish brown, very friable sandy loam with reddish yellow mottles.

This soil has moderate permeability in the silty material and rapid permeability in the underlying sandy material. Surface runoff is slow. The available water capacity is high. A seasonal high water table is at a depth of 2 to 5 feet. This soil has good tilth. The subsoil is low in available phosphorus and very low in available potassium. The surface layer is about 5 to 6 percent organic matter.

Most areas of this soil are in cultivated crops. This soil has good potential for cultivated crops, hay, pasture, and trees. It has poor potential for most engineering uses, and there is a pollution hazard if the soil is used for onsite sewage treatment.

This soil is well suited to corn, soybeans, and small grains and to grasses for hay and pasture. This soil can be used intensively for row crops, but it has a seasonal high water table. It tends to puddle if worked when wet. The use of subsurface drains allows more timely field operation in wet years. The installation of drains can be difficult in some places because the loose, water-bearing sand is at a depth of 4 feet. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and maintain good tilth. The need for lime in the surface layer varies according to liming practices in previous years. Generally, this soil needs lime if it has not been applied in the past 3 to 5 years.

If this soil is used for pasture, grazing should be restricted during wet periods. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is in capability class I.

920—Tama silt loam, sandy substratum, 0 to 2 percent slopes. This nearly level, well drained soil is on uplands and on loess-covered benches along streams. This soil formed in 40 to 60 inches of loess and in the underlying sandy material. Individual areas are broad and irregular in shape and are usually 100 to 200 acres or more in size.

Typically, the surface layer is very dark brown, friable silt loam about 10 inches thick. The subsurface layer is very dark grayish brown, friable silt loam about 12 inches thick. The subsoil is about 23 inches thick. The upper part is brown, friable silt loam that has very dark grayish brown coatings. The middle part is dark yellowish brown, friable silt loam. The lower part is yellowish brown, friable sandy loam. The substratum is yellowish brown, friable fine and medium sand to a depth of about 60 inches. In places are small areas of Waukegan soils.

This soil has moderate permeability in the silty material and rapid permeability in the underlying sandy material. Surface runoff is slow. The available water capacity is high. This soil has good tilth. The subsoil is medium in available phosphorus and very low in available potassium. The surface layer is about 3 to 4 percent organic matter.

Most areas of this soil are in cultivated crops. The soil has good potential for cultivated crops, hay, pasture, and trees. It has fair potential for most engineering uses, but there is a pollution hazard if this soil is used for onsite sewage treatment.

This soil is well suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. Crops planted in this soil can show signs of moisture stress if rainfall is below average. This soil tends to puddle if worked when wet. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and maintain good tilth. The need for lime in the surface layer varies according to previous liming practices. Generally, this soil needs lime if it has not been applied in the past 3 to 5 years.

If this soil is used for pasture, grazing should be restricted during wet periods. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is capability class I.

920B—Tama silt loam, sandy substratum, 2 to 5 percent slopes. This gently sloping, well drained soil is in uplands and on loess-covered benches along streams. It is on convex ridges and side slopes. This soil formed in 40 to 60 inches of loess and in the underlying sandy material. Individual areas are broad and irregular in shape and are usually 50 to 100 acres or more in size.

Typically, the surface layer is very dark brown, friable silt loam about 10 inches thick. The subsurface layer is very dark grayish brown, friable silt loam about 12 inches thick. The subsoil is about 23 inches thick. The upper part is brown, friable silt loam that has very dark grayish brown coatings. The middle part is dark yellowish brown, friable silt loam. The lower part is yellowish brown, friable sandy loam. The substratum is yellowish brown, friable fine and medium sand to a depth of about 60 inches. In some places the sand is at a depth of 3 feet.

This soil has moderate permeability. Surface runoff is medium. The available water capacity is high. This soil has good tilth. The subsoil is medium in available phosphorus and very low in available potassium. The surface layer is about 3 to 4 percent organic matter.

Most areas of this soil are in culitvated crops. This soil has good potential for cultivated crops, hay, pasture, and trees. It has fair potential for most engineering uses, but there is a pollution hazard if the soil is used for onsite sewage treatment.

This soil is well suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. When used for cultivated crops, this soil is subject to erosion. It tends to puddle if worked when wet. Crops

planted in this soil can show signs of moisture stress if rainfall is below average. Many areas have slopes that are long and smooth enough to be terraced and farmed on the contour. Channel cuts for terraces should be held to a minimum to avoid drought caused by coarse textured material that is 4 feet below the surface. Conservation practices that leave crop residue on the surface help reduce soil losses, increase infiltration of water, and conserve moisture. Returning crop residue to the surface or the regular addition of other organic material into the plow layer also helps improve fertility and maintain good tilth. The need for lime in the surface layer varies according to previous liming practices. Generally, the soil needs lime if it has not been applied in the past 3 to 5 years.

The use of this soil for pasture or hay is effective in controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, increased runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is in capability subclass IIe.

923—Coyne fine sandy loam, 0 to 2 percent slopes. This nearly level, well drained soil is on terraces along the Mississippi River and the lower reaches of its larger tributaries. Individual areas are broad and irregular in shape and are usually 10 to 50 acres in size.

Typically, the surface layer is very dark brown, friable fine sandy loam about 7 inches thick. The subsurface layer is very dark brown and dark brown, friable fine sandy loam about 14 inches thick. The subsoil is about 34 inches thick. The upper part is dark reddish brown, friable loam. The middle part is dark reddish brown, friable silt loam with brown and olive brown mottles. The lower part is yellowish brown, friable loam mottled with brown and olive brown. To a depth of about 60 inches, the substratum is brown, loose sand and 2 to 5 percent gravel.

Included with this soil in mapping are a few areas of soils that are gently sloping and on knolls. These soils are subject to erosion if left unprotected. These areas make up 5 to 10 percent of the unit.

This soil has moderately rapid permeability. Surface runoff is slow. The available water capacity is high. This soil has good tilth. The subsoil is generally very low in available phosphorus and has a medium level of available potassium. The surface layer is about 3 to 4 percent organic matter.

Most areas of this soil are in cultivated crops and hay. This soil has good potential for cultivated crops, hay, pasture, and trees. It has fair potential for most engineering uses.

This soil is well suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. It tends to puddle if worked when wet. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and maintain good tilth. The need for lime in the surface layer varies according to previous liming practices. Generally, the soil needs lime if it has not been applied in the past 3 to 5 years.

If this soil is used for pasture, grazing should be restricted during wet periods. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is in capability subclass IIs.

933—Sawmill silty clay loam, 0 to 2 percent slopes. This nearly level, poorly drained soil is on alluvial flood plains and in drainageways of uplands. This soil is subject to frequent flooding. Individual areas are long, broad, and irregular in shape and are usually 50 to 100 acres or more in size.

Typically, the surface layer is black, firm silty clay loam about 8 inches thick. The subsurface layer is black, firm silty clay loam about 4 inches thick. The subsoil is about 25 inches thick. The upper part is black, firm silty clay loam. The middle part is very dark gray, firm silty clay loam. The lower part is olive gray and dark gray, friable silty clay loam mottled with strong brown. To a depth of about 60 inches, the substratum is light olive gray, friable loam and silt loam with strong brown and light olive brown mottles.

Included with soil in mapping are a few areas of Elvira soils, which are in lower-lying depressions. These soils have high concentrations of iron and are more difficult to plow than the Sawmill soil. These areas make up 5 to 10 percent of the unit.

This soil has moderate permeability. Surface runoff is slow. The available water capacity is high. A seasonal high water table is at a depth of 0 to 2 feet. The tilth of this soil is fair. This soil is almost neutral throughout. The subsoil generally has a medium level of available phosphorus and is very low in available potassium. The surface layer is about 5 to 7 percent organic matter.

Most areas of this soil are in cultivated crops and hay. A few undrained areas are used for pasture. This soil has good potential for cultivated crops, hay, and pasture. It has fair potential for trees and poor potential for most engineering uses.

This soil is well suited to corn, soybeans, and small grains and to grasses for hay and pasture. This soil has a tendency to puddle if worked when wet. Cultivation is often delayed, unless this poorly drained soil is artificially drained. When installed, subsurface drains work fairly well if adequate outlets are available. Because of flooding, a good stand of row crops is difficult to establish in some years. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and maintain good tilth.

If this soil is used for pasture, grazing should be restricted during wet periods. Overgrazing or grazing

when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is in capability subclass IIw.

949—Zwingle Variant silty clay, 0 to 2 percent slopes. This nearly level, poorly drained soil is on high benches along the Mississippi River and the lower reaches of its major tributaries. This soil is subject to ponding. Individual areas are broad and irregular in shape and are usually 10 to 40 acres in size.

Typically, the surface layer is very dark gray, firm silty clay about 7 inches thick. The subsoil is about 53 inches thick. The upper part is grayish brown, firm clay with yellowish brown mottles. The middle part is grayish brown, reddish gray, and light olive brown clay that is very firm. It is mottled with yellowish brown. The lower part is grayish brown, firm silty clay and thin, grayish brown strata.

This soil has very slow permeability. Surface runoff is slow. The available water capacity is moderate. A seasonal high water table is at a depth of 1 foot or less. This soil has poor tilth. Generally, this soil is acid. The subsoil is generally very low in available phosphorus and has a medium level of available potassium. The surface layer is about 1 to 1 1/2 percent organic matter.

Most areas of this soil are in pasture. This soil has poor potential for cultivated crops but fair potential for hay, pasture, and trees. It has poor potential for most engineering uses.

This soil is poorly suited to corn, soybeans, and small grains. It is better suited to grasses for hay and pasture. In most cases if this soil is used for cultivated crops, the yields are low. The soil does not scour well if plowed. This soil also tends to puddle if worked when wet and to crust after hard rains. Seedling development is retarded if crusting occurs prior to emergence. Subsurface drains do not work well on this poorly drained soil because the high clay content causes the permeability to be very slow. Also, because of the very slow permeability, surface water ponds on very flat or in depressional areas after heavy rain. This water often remains on the surface for extended periods and further hampers crop production. Surface drains are needed in these areas to remove the excess water. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and soil tilth. The need for lime in the surface layer varies according to previous liming practices. Because of the acidity, this soil needs lime if it has not been applied in the past 3 or 4 years.

If this soil is used for pasture, grazing should be restricted during wet periods. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is moderately suited to trees if competing vegetation is controlled or removed. This can be accomplished by site preparation; by prescribed burning; or by spraying, cutting, or girdling. Use of equipment is limited by a seasonal high water table. Subsurface drains are needed to reduce seedling mortality and improve workability.

This soil is in capability subclass IIIw.

951F—Medary silt loam, 18 to 30 percent slopes. This steep and very steep, moderately well drained soil is along drainageways and on short escarpments that separate high benches from bottom land. Individual areas are along the Mississippi River and the lower reaches of its larger tributaries. They are narrow and irregular in shape and are usually 5 to 20 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 4 inches thick. The subsurface layer is reddish brown, friable silt loam about 4 inches thick. The subsoil is about 30 inches thick. The upper part is reddish brown, friable silty clay loam. The middle part is reddish brown, firm silty clay with strong brown and yellowish brown mottles. The lower part is reddish brown, firm silty clay. To a depth of about 60 inches, the substratum is dark red and reddish brown, firm silty clay and clay and thin, reddish brown strata.

Included with this soil in mapping are a few scattered areas of soils where gravel or limestone is at a depth of less than 48 inches. These soils tend to have limited water available for plant growth. These areas make up less than 5 percent of the unit.

This soil has slow permeability. Surface runoff is rapid. The available water capacity is high. The tilth of this soil is good, except in areas where erosion has exposed the clayey subsoil. In those areas tilth is poor. Generally, this soil is acid. The subsoil is generally very low in available phosphorus and has a medium level of available potassium. The surface layer contains less than one-half percent organic matter.

Most areas of this soil are in pasture or left idle. The soil has poor potential for cultivated crops, hay, and pasture and fair potential for trees. It has poor potential for most engineering uses.

This soil is not suited to row crops. It is better suited to grasses for hay and pasture. If this soil is left unprotected on the surface, it is subject to erosion because of the steep slopes. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and soil tilth. The need for lime in the surface layer varies according to previous liming practices. Because of the acidity, this soil responds to applications of lime every 3 or 4 years. It might not be possible, however, to use the application equipment on these steep slopes.

The use of this soil for pasture is an effective way of controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, increased runoff, and poor tilth. Proper stocking rates,

pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is moderately suited to trees if competing vegetation is controlled or removed. There is also a severe hazard of erosion and equipment limitations caused by the steepness of slopes. A vegetative cover should be maintained. Special seedbed preparation is needed on this clayey soil.

This soil is in capability subclass VIIe.

953—Darwin Variant silty clay, 0 to 2 percent slopes. This nearly level, poorly drained soil is on low benches along the Mississippi River and the lower reaches of its major tributaries. The soil is flooded when streams rise much above flood stage. Individual areas are broad and irregular in shape and are usually 5 to 20 acres in size.

Typically, the surface layer is black, firm silty clay about 9 inches thick. The subsurface layer is very dark gray, very firm clay about 6 inches thick. The subsoil is about 5 inches thick. It is dark reddish brown, very firm clay with dark brown mottles. Limestone bedrock is at a depth of about 20 inches. In some places the limestone is as shallow as 18 inches.

This soil has very slow permeability. Surface runoff is slow. The available water capacity is low. A seasonal high water table is at a depth of 0 to 2 feet. This soil has poor tilth. Reaction is only slightly acid or nearly neutral throughout. The subsoil is very low in available phosphorus and has a medium level of available potassium. The surface layer is about 4 to 5 percent organic matter.

Most areas of this soil are in pasture. The soil has poor potential for cultivated crops, hay, pasture, and trees. It has poor potential for most enginering uses.

This soil is poorly suited to corn, soybeans, and small grains. It is better suited to grasses for hay and pasture. In most cases if this soil is used for cultivated crops, the yields are very low. This soil does not scour well if plowed. It tends to puddle if worked when wet. It is subject to a seasonally high water table and localized flooding from runoff of nearby uplands. Subsurface drains do not work well because limestone is at a depth of 2 feet and because the high clay content causes very slow permeability. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and maintain soil tilth. Liming is seldom needed.

If this soil is used for pasture, grazing should be restricted during wet periods. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is in capability subclass VIw.

960—Shaffton loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on alluvial flood plains and low benches along the major streams and rivers in the county. This soil is subject to frequent flooding. Individual areas are broad and irregular in shape and are usually 50 to 150 acres in size.

Typically, the surface layer is black, friable loam about 8 inches thick. The subsurface layer is very dark grayish brown, friable loam with yellowish brown mottles. It is about 5 inches thick. The subsoil is about 26 inches thick. The upper part is brown and dark grayish brown, friable loam with grayish brown mottles. The middle part is dark grayish brown and brown, friable loam. The lower part is grayish brown, friable loam and very friable loamy sand with yellowish brown and strong brown mottles. To a depth of about 60 inches, the substratum is gray and grayish brown, friable silty clay loam and loose coarse sand mottled with dark yellowish brown.

Included with this soil in mapping are a few areas of poorly drained Ambraw soils. They are in shallow depressions, which hold water for extended periods. These areas make up 5 to 10 percent of the unit.

The permeability of this soil is moderate. Surface runoff is slow. The available water capacity is moderate. A seasonal high water table is at a depth of 3 to 5 feet. The tilth of this soil is good. The subsoil generally is low in available phosphorus and very low in available potassium. The surface layer is about 4 to 5 percent organic matter.

Many areas of this soil have been recently cleared and are now being used for cultivated crops and pasture. A few areas still remain in woodland. This soil has fair potential for cultivated crops and good potential for hay, pasture, and trees. It has poor potential for most engineering uses.

This soil is suited to corn, soybeans, and small grains and to grasses for hay and pasture. In some years a good stand of row crops is difficult to establish on this soil because of flooding. This soil is also subject to a seasonally high water table, which is often controlled by the level of the water in the nearby river. This soil has a tendency to puddle if worked when wet. Subsurface drains are difficult to install in this soil because of inadequate outlets. The need for lime in the surface layer varies according to previous liming practices. Generally, the soil needs lime if it has not been applied in the past 3 or 4 years.

If this soil is used for pasture, grazing should be restricted during wet periods. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is in capability subclass IIw.

961—Ambraw silty clay loam, 0 to 2 percent slopes. This nearly level, poorly drained soil is on alluvial flood plains along the major streams and rivers in the county. This soil is subject to frequent flooding. Individual areas are broad and irregular in shape and are usually 100 to 200 acres in size.

Typically, the surface layer is black, friable silty clay loam about 8 inches thick. The subsurface layer is very dark gray, friable loam. It is about 14 inches thick. The subsoil is about 25 inches thick. The upper part is dark gray, friable loam with brown mottles. The middle part is gray, friable sandy loam with brown mottles. The lower part is gray, friable sandy loam with brown mottles. To a depth of about 60 inches, the substratum is gray and grayish brown, very friable loamy fine sand with olive brown mottles.

Included with this soil in mapping are a few areas of somewhat poorly drained Shaffton soils. These soils are wet for shorter lengths of time. They are on higher positions of the landscape. These areas make up 5 to 10 percent of the unit.

The permeability of this soil is moderate or moderately slow. Surface runoff is slow. Water ponds in depressional areas. The available water capacity is high. A seasonal high water table is at a depth of 0 to 2 feet. The tilth of this soil is fair. The subsoil generally is low in available phosphorus and very low in available potassium. The surface layer is about 4 to 5 percent organic matter.

Many areas of this soil have been recently cleared and are now being used for cultivated crops and pasture. A few areas still remain in woodland. This soil has poor potential for cultivated crops and fair potential for hay, pasture, and trees. It has poor potential for most engineering uses.

This soil is poorly suited to corn, soybeans, and small grains. It is better suited to grasses for hay and pasture. In the lower lying swales, water collects and stands for extended periods of time after floodwaters have receded. This soil has a tendency to puddle if worked when wet. In most years a good stand of row crops is difficult to establish on this soil. This soil is subject to a high water table, which is often controlled by the level of the water in the nearby river. Subsurface drains are difficult to install in this soil because of inadequate outlets. The need for lime in the surface layer varies according to previous liming practices. Generally, this soil needs lime if it has not been applied in the past 3 to 5 years.

If this soil is used for pasture, grazing should be restricted during wet periods. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is in capability subclass IIw.

962—Elvira silty clay loam, 0 to 2 percent slopes. This nearly level, poorly drained soil is on alluvial flood plains, on low benches, and in shallow depressions. It is some distance from the main stream channel but is subject to frequent flooding. Individual areas are broad and regular in shape and are usually 50 to 100 acres in size.

Typically, the surface layer is black, firm silty clay loam about 7 inches thick. The subsurface layer is black, firm silty clay loam about 8 inches thick. The subsoil is about 19 inches thick. The upper part is dark gray and yellowish red, firm silty clay loam with yellowish red mottles. To a depth of about 60 inches, the substratum is grayish brown, friable silty clay loam and sandy loam with yellowish red and grayish brown mottles.

Included with this soil in mapping are areas of Colo and Sawmill soils. The Colo and Sawmill soils, unlike Elivra soils, lack the high concentrations of iron. They are on slightly higher positions of the landscape. These areas make 5 to 10 percent of the unit.

The permeability of this soil is moderate. Surface runoff is slow and water ponds in depressional areas. The available water capacity is high. A seasonal high water table is at a depth of 1 foot to 3 feet. This soil has fair tilth. The subsoil generally has a medium level of available phosphorus and is very low in available potassium. The surface layer is about 5 to 7 percent organic matter.

Most areas of this soil are in cultivated crops and hay. A few undrained areas are used for pasture. The soil has fair potential for cultivated crops and for trees. It has good potential for hay and pasture. It has poor potential for most engineering uses.

This soil is suited to corn, soybeans, and small grains and to grasses for hay and pasture. It puddles if worked when wet and does not scour when plowed. Cultivation is often delayed, unless this poorly drained soil is artificially drained. If adequate outlets are available, subsurface drains work fairly well. In areas where this soil is frequently flooded or ponded, a good stand of row crops is difficult to establish. This soil contains high concentrations of iron, which can affect the availability of some plant nutrients. Special applications of fertilizer might be needed to correct nutrient imbalances. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and maintain soil tilth. The need for lime in the surface layer varies according to previous liming practices. Generally, the soil needs lime if it has not been applied in the past 3 to 5 years.

If this soil is used for pasture, grazing should be restricted during wet periods. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is in capability subclass IIw.

963—Elvers silt loam, 0 to 2 percent slopes. This nearly level, poorly drained soil is on alluvial flood plains and near areas of organic soil, which are adjacent to mineral soils in uplands. This soil is subject to frequent flooding. Individual areas are long or broad and regular in shape and are usually 25 to 80 acres or more in size.

Typically, the surface layer is dark grayish brown and grayish brown, friable silt loam. It is a plow layer about 7

inches thick. Stratified, dark grayish brown and grayish brown, friable silt loam with dark brown mottles extends to a depth of 35 inches. From about 35 to 55 inches is black, friable sapric material. To a depth of about 60 inches, the substratum is dark greenish gray, friable silt loam with light olive mottles.

Included with this soil in mapping are Chaseburg soils. The Chaseburg soils are on somewhat higher positions of the landscape. Also included are a few areas of Palms soils, in depressions, where the organic materials have not been covered over with silty strata. These soils are more wet than the Elvers soil. These areas make up less than 5 percent of the unit.

This soil has moderate permeability. Surface runoff is slow. The available water capacity is high. A seasonal high water table is at a depth of 0 to 1 foot. This soil has good tilth. The subsoil is generally very low in available phosphorus and potassium. The surface layer is about 2 to 3 percent organic matter.

Most areas of this soil are in cultivated crops and hay. A few undrained areas are used for pasture. The soil has good potential for cultivated crops and for hay and pasture. It has fair potential for trees and poor potential for most engineering uses.

This soil is well suited to corn, soybeans, and small grains and to grasses for hay and pasture. This soil tends to puddle if worked when wet. If adequate drainage is provided and if this soil is not subject to further siltation, row crops can be grown quite well. In some areas subsurface drains are difficult to install because of the variability in depth to the underlying mineral layers where the drains need to be placed. Outlets for drains are difficult to find in some areas. Because of flooding, a good stand of row crops is difficult to establish in some years. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and maintain good tilth. The need for lime in the surface layer varies according to previous liming practices. Generally, this soil needs lime if it has not been applied in the past 3 to 5 years.

If this soil is used for pasture, grazing should be restricted during wet periods. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is moderately suited to trees that tolerate wet soil conditions. Trees, cuttings, and seedlings survive and grow if competing vegetation is controlled or removed. This soil has a seasonal high water table that can limit use of equipment. Seedling mortality is high because of the wetness of this soil. Subsurface drains are needed.

This soil in capability subclass IIw.

976—Raddle silt loam, 0 to 2 percent slopes. This nearly level, well drained soil is on benches adjacent to major streams and rivers. Individual areas are broad and irregular in shape and usually 50 to 100 acres in size.

Typically, the surface layer is black, friable silt loam about 7 inches thick. The subsurface layer is black and very dark grayish brown, friable silt loam about 12 inches thick. The subsoil is about 24 inches thick. The upper part and middle part are brown, friable silt loam. The lower part is yellowish brown, friable silt loam. To a depth of about 60 inches, the substratum is brown, friable silt loam with dark yellowish brown mottles.

Included with this soil in mapping, within the city of Clinton, is a significant amount of heavily urbanized land. These areas have been greatly modified by the building of houses, factories, and streets and by installations of various underground pipe and cable. Because of the extensive amount of land modification, some of the soil properties characteristic to the Raddle soils, which are in these areas, can be somewhat altered. Also included are areas of soils that are on lower lying positions within the city of Clinton. These soils could be flooded more frequently if they were not protected by dikes.

This soil has moderate permeability. Surface runoff is slow. The available water capacity is very high. The subsoil is generally very low in available phosphorus and potassium. The surface layer is about 3 to 4 percent organic matter.

Most areas of this soil are in cultivated crops and hay. This soil has good potential for cultivated crops, hay, pasture, and trees. It has fair potential for most engineering uses.

This soil is well suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. In some areas conservation practices are needed on adjacent, more sloping soils to protect this soil from siltation. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and maintain good tilth. The need for lime in the surface layer varies according to previous liming practices. Generally, the soil needs lime if it has not been applied in the past 3 to 5 years.

If this soil is used for pasture, grazing should be restricted during wet periods. Overgrazing or grazing when the soil is too wet, however, causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is in capability class I.

1118—Garwin silty clay loam, benches, 0 to 2 percent slopes. This nearly level, poorly drained soil is on loess-covered benches above the flood plain. Individual areas are irregular in shape and are usually 10 to 30 acres in size.

Typically, the surface layer is black, friable silty clay loam about 7 inches thick. The subsurface layer is black, friable silty clay loam about 11 inches thick. The subsoil is about 32 inches thick. The upper part is dark gray, friable silty clay loam that has very dark gray coatings.

The lower part is olive gray, friable silty clay loam, which has dark gray coatings and yellowish brown and brown mottles. To a depth of about 60 inches, the substratum is olive gray, friable silt loam, which has dark gray coatings and yellowish brown mottles. In places coarse sand is at a depth of 7 or 8 feet.

Included with this soil in mapping are small areas of Muscatine soils. These soils are on higher positions of the landscape and are not as poorly drained as this Garwin soil. These areas make up less than 5 percent of the unit.

This soil has moderate permeability. Surface runoff is slow. The available water capacity is high. A seasonal high water table is at a depth of 1 foot to 2 feet. This soil has good tilth. Generally, the surface layer of this soil is neutral. The subsoil is low in available phosphorus and very low in available potassium. The surface layer is about 5 1/2 to 6 1/2 percent organic matter.

Most areas of this soil are in cultivated crops. The soil has good potential for cultivated crops, hay, and pasture but fair potential for trees. It has poor potential for most engineering uses.

This soil is well suited to corn, soybeans, and small grains and to grasses for hay and pasture. It is suited to intensive use for row crops. It commonly receives runoff from adjacent slopes, however, and is wet during the spring. It puddles if worked when wet. Artificial drainage is needed to lower the water table and to allow more timely field operations. Areas of this soil that are not adequately drained are generally used for pasture. In some areas conservation practices are needed on soils upslope to reduce runoff and siltation onto this soil. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and soil tilth. This soil seldom needs lime.

If this soil is used for pasture, grazing should be restricted during wet periods. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is in capability subclass IIw.

1119—Muscatine silt loam, benches, 1 to 3 percent slopes. This very sloping, somewhat poorly drained soil is on loess-covered benches above the flood plain. Individual areas are long and irregular in shape and are usually 20 to 80 acres in size.

Typically, the surface layer is black, friable silt loam about 8 inches thick. The subsurface layer is black and very dark brown, friable silt loam and silty clay loam about 11 inches thick. The subsoil is about 36 inches thick. The upper part is dark grayish brown, friable silty clay loam that has very dark grayish brown coatings. The middle part is grayish brown, friable silty clay loam, which has dark brown coatings and strong brown mottles. The lower part is mottled grayish brown and strong brown, friable silty clay loam. The substratum is mottled yellowish brown and grayish brown, friable silt loam to a depth of about 60 inches. In places coarse sand is at a depth of 7 or 8 feet.

Included with this soil in mapping are a few small areas of Atterberry soils. These areas are scattered throughout the unit. The Atterberry soils have a thinner surface layer that is lower in organic matter than that of the Muscatine soil. Also included are Tama soils that are well drained. They are on higher positions of the benches. These areas make up less than 5 percent of the unit.

This soil has moderate permeability. Surface runoff is slow. The available water capacity is high. A seasonal high water table is at a depth of 2 to 4 feet. The soil has good tilth. The subsoil is low in available phosphorus and very low in available potassium. The surface layer is about 5 to 6 percent organic matter.

Most areas of this soil are in cultivated crops. The soil has good potential for cultivated crops, hay, pasture, and trees. It has a poor potential for most engineering uses.

This soil is well suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. This soil can be used intensively for row crops. It commonly receives runoff from adjacent slopes and has a seasonal high water table. This soil tends to puddle if worked when wet. Subsurface drains allow more timely field operations. In some areas conservation practices are needed on soils upslope to reduce runoff and siltation onto this soil. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and maintain good tilth. The need for lime in the surface layer varies according to previous liming practices. Generally, this soil needs lime if it has not been applied in the past 3 to 5 years.

If this soil is used for pasture, grazing should be restricted during wet periods. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is in capability class I.

1142—Chaseburg silt loam, channeled, 0 to 2 percent slopes. This nearly level, moderately well drained soil is in narrow stream valleys. The stream channel meanders from one side of the valley to the other to such an extent that tillage is difficult and impractical in most areas. This soil is subject to frequent flooding. Individual areas are long and irregular in shape and are usually 50 to 100 acres or more in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 7 inches thick. To a depth of about 60 inches, the substratum is stratified dark grayish brown, brown, and grayish brown silt loam that is friable. In some places a buried soil of black silt loam is 20 to 40 inches beneath the surface.

This soil has moderate permeability. Surface runoff is slow. The available water capacity is very high. A seasonal high water table is at a depth of 3 to 6 feet. Generally, this soil has good tilth. The substratum generally is low in available phosphorus and very low in available potassium. The surface layer is about 2 to 3 percent organic matter.

Most areas of this soil are in pasture or left idle. This soil has good potential for pasture and poor potential for cultivated crops and hay. It has poor potential for most engineering uses.

This soil is poorly suited to row crops. It is frequently flooded. The presence of old oxbow channels along meandering streams makes it difficult to maneuver farm machinery to establish a crop. This soil is better suited to pasture. When left idle, this soil often becomes covered with a scrubby vegatation of brush and small trees. Some of these areas would be suitable for crops if the scrub vegetation is cleared, the stream channel straightened, and the old oxbow channels filled. After renovation this soil is still subject to flooding and siltation. It puddles if worked when wet. Generally, it does not need lime.

If this soil is used for pasture, overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is moderately suited to trees. Tree seeds, cuttings, and seedlings survive and grow if competing vegetation is controlled or removed. This can be accomplished by site preparation; by prescribed burning; or by spraying, cutting, or girdling.

This soil is in capability subclass Vw.

1160—Walford silt loam, benches, 0 to 1 percent slopes. This level, poorly drained soil is on loess-covered benches along streams. Individual areas are broad and irregular in shape and are usually 20 to 60 acres in size.

Typically, the surface layer is very dark gray, friable silt loam about 9 inches thick. The subsurface layer is grayish brown, friable silt loam about 10 inches thick. The subsoil is about 35 inches thick. The upper part is grayish brown, friable silty clay loam with olive brown and yellowish brown mottles. The lower part is grayish brown and light olive gray, friable silty clay loam with brown and strong brown mottles. To a depth of about 60 inches, the substratum is light olive gray, friable silt loam with yellowish brown mottles. In places coarse sand is at a depth of 7 or 8 feet.

This soil has slow permeability. Surface runoff is slow, and water ponds in some areas. The available water capacity is high. A seasonal high water table is at a depth of 0 to 2 feet. This soil has fair tilth. Generally, this soil is acid in the surface layer. The subsoil is low in available phosphorus and very low in available potassium. The surface layer is about 2 1/2 to 3 1/2 percent organic matter.

Most areas of this soil are in cultivated crops. This soil has fair potential for cultivated crops, hay, pasture, and trees. It has poor potential for most engineering uses.

This soil is suited to corn, soybeans, and small grains and to grasses for hay and pasture. This soil is suited to intensive use for row crops if adequately drained. It tends to puddle if worked when wet. In some areas plowing this soil mixes part of the subsurface layer into the plow layer, which causes crusting after hard rains. Seedling development is retarded if crusting occurs prior to emergence. In some areas water ponds for short periods, so crops can be drowned in some years. The soil also has a high water table and in some places receives runoff from upslope. Drainage by subsurface drains or open ditches is needed to successfully lower the water table and reduce ponding. In some areas conservation practices are needed on soils upslope to reduce runoff and siltation onto this soil. Areas of this soil that are not adequately drained are generally used for pasture or hay. Returning crop residue to the surface or the regular addition of organic material into the plow layer helps improve fertility and soil tilth. Because of the acidity, this soil needs lime if it has not been applied in the past 3 or 4 years.

If this soil is used for pasture, grazing should be restricted during wet periods. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is in capability subclass IIIw.

1291—Atterberry silt loam, benches, 1 to 3 percent slopes. This very gently sloping, somewhat poorly drained soil is on loess-covered benches along streams. Individual areas are irregular in shape and are usually 30 to 60 acres in size.

Typically, the surface layer is black and very dark gray, friable silt loam about 9 inches thick. The subsurface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsoil is about 27 inches thick. The upper part is brown, friable silty clay loam with yellowish brown mottles. The lower part is grayish brown, friable silty clay loam with yellowish brown and strong brown mottles. To a depth of about 60 inches, the substratum is grayish brown, friable silt loam with yellowish brown mottles. In places coarse sand is at a depth of 7 or 8 feet.

Included with this soil in mapping are a few small areas of Walford soils. The Walford soils are poorly drained and are in shallow depressions. The soils are usually wet during the spring. These areas make up 10 to 20 percent of the unit.

This soil has moderate permeability. Surface runoff is slow. The available water capacity is high. A seasonal high water table is at a depth of 1 foot to 3 feet. This soil has good tilth. The subsoil is low in available phosphorus and very low in available potassium. The surface layer is about 2 1/2 to 3 1/2 percent organic matter.

Most areas of this soil are in cultivated crops. The soil has good potential for cultivated crops, hay, pasture, and trees. It has poor potential for most engineering uses.

This soil is well suited to corn, soybeans, and small grains and to grasses for hay and pasture. This soil is well suited to intensive use for row crops if it is well managed. It has a seasonally high water table. It tends to puddle if worked when wet. In some areas plowing this soil mixes part of the subsurface layer into the plow layer, which causes crusting after hard rains. Seedling development is retarded if crusting occurs prior to emergence. Subsurface drains are generally needed to permit timely field operations. In some areas conservation practices are needed on soils upslope to reduce runoff and siltation onto this soil. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and maintain good tilth. The need for lime in the surface layer varies according to liming practices of previous years. Generally, this soil needs lime if it has not been applied in the past 3 to 5 years.

If this soil is used for pasture, grazing should be restricted during wet periods. Overgrazing or grazing when the soil is too wet causes surface compaction and results in poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is moderately well suited to trees. Tree seeds, cuttings, and seedlings survive and grow well if competing vegetation is controlled or removed. This can be accomplished by site praparation; by prescribed burning; or by spraying, cutting, or girdling.

This soil is in capability class I.

1777—Wapsie Variant loam, 0 to 2 percent slopes. This nearly level, well drained soil is on low benches within the flood plain of the Wapsipinicon River. This soil is subject to frequent flooding. Individual areas are irregular in shape and are usually 5 to 20 acres in size.

Typically, the surface layer is very dark grayish brown, friable loam about 6 inches thick. The subsurface layer is dark brown, friable loam about 3 inches thick. The subsoil is about 12 inches thick. The upper part is brown, friable loam. The lower part is dark brown, friable sandy loam. The substratum is stratified yellowish brown and brown, loose fine sand and medium sand to a depth of about 60 inches.

Included with this soil in mapping are scattered areas of alluvial sand, which is more droughty than this Wapsie Variant. These areas make up 5 to 10 percent of the unit.

This soil has moderate permeability in the loamy material and rapid permeability in the underlying sand. Surface runoff is slow. The available water capacity is moderate. This soil has good tilth. The subsoil is low in available phosphorus and very low in available potassium. The surface layer is about 1 to 2 percent organic matter.

Most areas of this soil are in cultivated crops, hay, and pasture. The soil has fair potential for cultivated crops, hay, pasture, and trees. It has poor potential for most engineering uses.

This soil is suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. Later in the growing season it is droughty, but production of crops is good if rainfall is normal and timely. The soil tends to puddle if worked when wet. If this soil is used for cultivated crops, it is subject to wind erosion. Conservation practices that leave crop residue on the surface help reduce soil blowing and conserve moisture. Returning crop residue to the surface or the regular addition of other organic material into the plow layer also helps improve fertility and increase infiltration of water. The need for lime in the surface layer varies according to previous liming practices. Because of the acidity, this soil needs lime if it has not been applied in the past 3 or 4 years.

The use of this soil for pasture or hay is an effective way of controlling wind erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing and restricted use during wet and very dry periods help keep the pasture and soil in good condition.

This soil is moderately suited to trees if competing vegetation is controlled or removed. This can be accomplished by site praparation; by prescribed burning; or by spraying, cutting, or girdling.

This soil is in capability subclass IIw.

1954—Darwin silty clay, bedrock substratum, 0 to 2 percent slopes. This nearly level, very poorly drained soil is on the flood plain of the Mississippi River. It is in the alluvial backwater areas. It is located where lacustrine clays have been deposited some distance from the main stream channel. This soil is subject to frequent flooding. Individual areas are broad and irregular in shape and are usually 10 to 50 acres in size.

Typically, the surface layer is black, firm silty clay about 7 inches thick. The subsurface layer is black, firm silty clay about 5 inches thick. The subsoil is about 24 inches thick. The upper part is black, firm clay. The middle part is olive gray, firm clay. The lower part is mottled olive gray, olive, and yellowish brown silty clay that is firm. The substratum is mottled olive gray and yellowish brown silty clay loam that is firm. Below this is a silty substratum. Limestone bedrock is at a depth of about 4 feet.

The permeability of this soil is very slow. Surface runoff is slow, or water is ponded in depressional areas. The available water capacity is low. A seasonal high water table is at a depth of 0 to 2 feet. This soil has poor tilth. It is mildly alkaline throughout the profile. The subsoil is medium in available phosphorus and has a low level of available potassium. The surface layer is about 5 to 7 percent organic matter.

Most areas of this soil are in pasture. The soil has poor potential for cultivated crops but fair potential for hay, pasture, and trees. It has poor potential for most engineering uses.

This soil is poorly suited to corn, soybeans, and small grains. It is better suited to grasses for hay and pasture. This soil is subject to frequent flooding for long periods of time and crop losses often result. This soil does not scour well if plowed. It tends to puddle if worked when wet. Subsurface drains do not work well on this very poorly drained soil because the high clay content causes very slow permeability. Also, the very slow permeability causes surface water to pond on very flat or in depressional areas after a heavy rain. This water often remains on the surface for extended periods of time and further hampers crop production. If outlets are available, surface drains need to be installed in these areas to remove the excess water. Returning crop residue to the surface or the regular addition of other organic material into the plow layer helps improve fertility and maintain soil tilth. Lime is not needed on this soil.

If this soil is used for pasture, grazing should be restricted during wet periods. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is in capability subclass Vw.

5010—Pits, gravel. These pits are 20 feet deep or more. The pits are irregular in shape and range from a few acres to 40 acres in size. The pits result from areas where sand or gravel has been removed to be used for roads or other purposes.

The material that remains in these pits is variable in texture; however, most is either sandy or gravelly. These areas can support only vegetation that is very tolerant of drought. These areas can be used for wildlife if a suitable habitat of vegetative growth is produced.

5030—Pits, quarries. These pits are 40 feet deep or more and have piles of spoil material surrounding them. The pits are irregular in shape and range from a few acres to 40 acres in size. Some pits have steep side walls. They contain water that is a few feet deep to many feet deep. These pits are the result of limestone being quarried to be used for roads and as agricultural lime.

The spoil material surrounding the pits is variable in texture; however, most is loamy and contains various amounts of limestone fragments. Before being scraped aside, the spoil material in most areas was either loess or loamy sediments. In some areas the spoil has been leveled and smoothed and is capable of supporting grass or trees. The pH factor of the spoil varies but generally ranges from medium acid to mildly alkaline.

These areas are suitable for wildlife habitat. The quarries that contain water support fish. These areas may be dangerous as recreational areas, however, because of the steep side walls and variable depth of the water. Each site needs an onsite investigation to determine safety.

5040—Orthents, loamy. This map unit is borrow pits or other disturbed land areas. In these areas the former soil has been completely removed, or so truncated that it is impossible to classify the soil in a specific soil series.

The borrow pits generally have 3 to 10 feet of material removed for construction purposes. It is difficult to establish vegetation on the vertical cuts of very sloping banks of these pits. Most areas contain some vegetation and commonly are left idle.

The disturbed or made land is variable in texture but is mostly loamy. Most areas have undergone extensive land leveling and grading for industrial, business, and housing development. Some form of vegetation can be established in most areas. Plant growth generally is poor, however, on these recently exposed surfaces.

The potential for this unit is quite variable. Some areas have good potential as future construction sites, while others are best left idle or used for pasture.

use and management of the soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

crops and pasture

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed soil map units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

In 1974, according to the State of Iowa Annual Farm Census (*17*), 296,562 acres in Clinton County was in crops, 53,730 acres was in pasture, and 60,962 acres was used for other purposes. Corn, soybeans, oats, legumes, and grasses are the principal crops. Most of the permanent pastures are in bluegrass. Some pastures have been renovated, and birdsfoot trefoil was introduced. Grass-legume mixtures, such as alfalfa-bromegrass, are also used for pasture. Most permanent bluegrass pasture is not used for crops because the soils are wet and need subsurface or surface drainage. Each year, however, many acres are converted to cropland. The Clyde and Marshan soils are the dominant ones that remain in pasture because they need drainage.

Soil erosion is a major concern on more than 60 percent of the cropland and pasture in Clinton County. The hazard of erosion is influenced by slope of the land, erodibility of the soil, rainfall, and amount and type of vegetative cover.

The loss of soil through erosion is damaging for several reasons. Erosion causes loss of nutrients and water in the soil, formation of gullies on side slopes, deterioration of soil tilth, detrimental sedimentation downslope, and pollution of streams and water reservoirs. Soil productivity generally is reduced as the surface layer is lost and increasing amounts of subsoil are incorporated into the plow layer. This is especially true of soils that have low fertility and a moderately fine textured subsoil, such as the Lindley and Fayette soils. Erosion also reduces productivity on droughty soils, such as the Sparta and Dickinson soils, because of loss of the organic surface layer. Soils that are shallow or moderately deep to limestone bedrock, such as the Nordness and Rockton soils, are permanently damaged by erosion.

Preparing a good seedbed or tilling is difficult on severely eroded Fayette soils where the original surface layer of friable silt loam has been eroded away. The subsoil of silty clay loam exposed on the surface becomes hard and cloddy if worked when wet.

Erosion control practices provide protective surface cover, which reduces runoff and increases water infiltration. A cropping system that keeps vegetative cover on the surface for extended periods can hold soil.

erosion losses to amounts that do not reduce the productive capacity of the soil. On livestock farms, which require pasture and hay, the legume and grass forage crops in the cropping system reduce erosion on sloping land and also provide nitrogen and improve tilth for the following crop.

Terraces and diversions reduce the length of slope, runoff, and erosion. They are most practical on deep, well drained soils that have long, uniform slopes. Many of the Downs, Fayette, and Tama soils are well suited to terracing. Other soils are less suitable for terracing and diversions because of irregular slopes, steepness of slope, or bedrock at a depth of less than 40 inches.

Providing adequate erosion control and drainage is difficult in the Kenyon and Olin soils. In these soils the loamy upper part is more permeable than the glacial till in the lower part. Water tends to move more rapidly in the loamy material then to accumulate at the till, where it flows along the till and seeps out of hillsides during wet periods. Because of this difficulty, a combination of terracing and subsurface drainage is most likely to be successful. Gully control structures and grassed waterways are used to stop deep cutting in water courses.

Terracing is not practical on soils that have short, irregular slopes and coarse textures, such as the Chelsea and Sparta soils. On these soils, using a cropping system that provides substantial vegetative cover and minimum tillage, which leaves residue on the surface, is effective in reducing erosion.

Contour farming and contour stripcropping are erosion control practices widely used in this county. They are best adapted to soils that have smooth, uniform slopes, for example most areas of the Downs, Fayette, and Tama soils.

Wind erosion is a hazard on the sandy Chelsea and Sparta soils and the Palms muck soils. Maintaining vegetative cover, surface mulch, or rough surfaces minimize wind erosion on these soils. Windbreaks of adapted shrubs, such as Tatarian honeysuckle or autumn-olive, are effective in reducing wind erosion on the muck soils.

Soil drainage is also a major management need in Clinton County. Poorly drained and somewhat poorly drained soils make up about 20 percent of the total acreage in the county. Subsurface drainage is used to reduce wetness in bottom-land soils, such as the Colo and Zook soils, and in upland soils, such as the Clyde and Schley soils.

The design of both surface and subsurface drainage systems varies with the kind of soil. Most somewhat poorly drained and poorly drained soils used intensively for row cropping need a combination of surface drainage and protection against runoff from higher slopes. Drains have to be more closely spaced in soils that are moderately slowly permeable than in the more permeable soils.

Organic soils oxidize and subside when the pore space is filled with air; therefore, the Palms muck soils need special drainage systems to control the depth and the period of drainage. Oxidation and subsidence in organic soils can be minimize by keeping the water table at the lower level required by crops during the growing season and raising the water table to the surface during other parts of the year.

Soil fertility, in terms of phosphorus and potassium available in the subsoil, is low or very low in most soils in Clinton County. The Fayette soils are high in available phosphorus, and the Downs soils are medium in available phosphorus. Most upland soils are acid in the subsoil. These soils require applications of ground limestone to sufficiently raise the pH level for alfalfa and other crops that produce better yields on nearly neutral soils. The poorly drained Clyde and Maxfield soils are generally neutral in reaction.

Most medium textured; well drained soils on uplands formed under forest vegetation and contain about 1 to 2 percent organic matter. The medium textured, well drained soils that formed under forest and grass vegetation, such as the Downs soils, contain about 2 to 3 percent organic matter. The medium textured soils that formed under grass vegetation, such as the Kenyon and Tama soils, contain about 3 to 4 percent organic matter. The coarse textured soils on uplands generally contain less than 1 percent organic matter. The poorly drained soils on uplands, such as the Clyde soils, contain from 7 to 11 percent organic matter. The Palms soils, which are very poorly drained and are organic, contain more than 30 percent organic matter.

Soils that formed from alluvium on bottom lands are neutral or slightly acid in reaction. The organic matter content ranges from about 2 to 3 percent in the Chaseburg soils to 5 to 7 percent in the Colo soils. Alluvial soils in Clinton County are generally low or very low in available phosphorus and available potassium in the subsoil.

The Aredale, Dinsdale, Downs, Fayette, Kenyon, Mt. Carroll, and Tama soils respond well to a high level of management and fertilization. Applications of lime and fertilizer should be based on the results of soil tests, need of the intended crop, and on the expected level of yields. The Cooperative Extension Service can help determine the kinds and amounts of fertilizer and lime to apply.

Soil tilth is an important factor in the germination of seeds and in the infiltration of water into the soil. Soils that have good tilth are generally high in organic matter, are granular, and are porous.

Many of the soils on uplands have a light colored surface layer that is moderately low to low in organic matter. Generally, the structure of the surface layer is weak, and intense rainfall causes the formation of a crust on the surface. The crust is hard when dry and is less pervious to water. Once the crust forms, it reduces infiltraiton and increases runoff. Regular additions of crop residue, manure, and other organic material can help improve soil structure and reduce formation of crust.

Fall plowing is generally not considered a good practice on the soils in this county by conservationists and environmentalists. Fall plowing increases the hazard of wind erosion if the soils are not protected by cover crops, windbreaks, or snow. It also increases the hazard of erosion early in the spring during snow melt and runoff.

yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; and harvesting that insures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils.

land capability classification

Land capability classification (*19*) shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have slight limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

The acreage of soils in each capability class and subclass is shown in table 6. The capability classification of each map unit is given in the section "Detailed soil map units."

woodland management and productivity

Trees are mainly confined to areas that are generally unsuitable for cultivated crops. Timber in Clinton County has been reduced in recent years in order to grow crops and pasture. In this section the potential for producing trees and management practices are discussed.

Table 7 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination (woodland suitability) symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *x* indicates stoniness or rockiness; *w*, excessive water in or on the soil; *t*, toxic substances in the soil; *d*, restricted root depth; *c*, clay in the upper part of the soil; *s*, sandy texture; *f*, high content of coarse fragments in the soil profile; and *r*, steep slopes. The letter *o* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: x, w, t, d, c, s, f, and r.

In table 7, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Ratings of the *erosion hazard* indicate the risk of loss of soil in well managed woodland. The risk is *slight* if the expected soil loss is small, *moderate* if measures are needed to control erosion during logging and road construction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive loss of soil.

Ratings of *equipment limitation* reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or in equipment; and *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree to which the soil affects the mortality of tree seedlings. Plant competition is not considered in the ratings. The ratings apply to seedlings from good stock that are properly planted during a period of sufficient rainfall. A rating of *slight* indicates that the expected mortality is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Ratings of *plant competition* indicate the degree to which undesirable plants are expected to invade where there are openings in the tree canopy. The invading plants compete with native plants or planted seedlings. A rating of *slight* indicates little or no competition from other plants; *moderate* indicates that plant competition is expected to hinder the development of a fully stocked stand of desirable trees; *severe* indicates that plant competition is expected to prevent the establishment of a desirable stand unless the site is intensively prepared, weeded, or otherwise managed to control undesirable plants.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

Trees to plant are those that are suited to the soils and to commercial wood production.

windbreaks and environmental plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, hold snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To insure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Table 8 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 8 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Soil Conservation Service or the Cooperative Extension Service or from a nursery.

recreation

The primary recreational facilities are near the Wapsipinicon and Mississippi Rivers in the southern and eastern part of the county. These areas have an abundance of wild game for hunting and fishing. They also have picnic and camping areas.

The soils of the survey area are rated in table 9 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the

surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 9, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 9 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 12 and interpretations for dwellings without basements and for local roads and streets in table 11.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking, horseback riding, and bicycling should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

wildlife habitat

In Clinton County much wildlife cover has been destroyed during recent years because of the intensive cropping systems. Thus, the wildlife have migrated to the areas that are poorly suited for growing crops. These areas are primarily along the Wapsinpinicon and Mississippi Rivers and around Goose Lake.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 10, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops

are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, soybeans, and oats.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are orchardgrass, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, wheatgrass, and grama.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, the available water capacity, and wetness. Examples of these plants are oak, poplar, cherry, apple, dogwood, hickory, blackberry, and elderberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are Russian-olive, autumn-olive, and crabapple.

Coniferous plants furnish browse, seeds, and cones. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and juniper.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, wild rice, saltgrass, cordgrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite, pheasant, meadowlark, field sparrow, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, and deer.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design (*4*).

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-

swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

building site development

Table 11 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

sanitary facilities

Table 12 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 12 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less

desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and that overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to effectively filter the effluent. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 12 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 12 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

construction materials

Table 13 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil

layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 13, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

water management

Table 14 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed ponds. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high,

constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances, such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

soil properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

engineering index properties

Table 15 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil series and their morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture (*18*). These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains particles coarser than sand, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as Pt. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

physical and chemical properties

Table 16 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion and the amount of soil lost. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.
2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible. Crops can be grown if intensive measures to control wind erosion are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.

5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible. Crops can be grown if measures to control wind erosion are used.

6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible. Crops can easily be grown.

7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible. Crops can easily be grown.

8. Stony or gravelly soils and other soils not subject to wind erosion.

soil and water features

Table 17 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt and water in swamps and marshes are not considered flooding.

Table 17 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered is local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 17 are the depth to the seasonal high water table; the kind of water table—that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 17.

An apparent water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. An artesian water table is under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole.

A perched water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations generally can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavations.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

classification of the soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*20*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. In table 18, the soils of the survey area are classified according to the system. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Mollisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquoll (*Aqu*, meaning water, plus *oll*, from Mollisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Haplaquolls (*Hapl*, meaning minimal horizonation, plus *aquoll*, the suborder of the Mollisols that have an aquic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Haplaquolls.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, mesic Typic Haplaquolls.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

soil series and their morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (*18*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*20*). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed soil map units."

Ambraw series

The Ambraw series consists of poorly drained, moderately permeable or moderately slowly permeable soils on flood plains. These soils formed in alluvial sediments. Slope ranges from 0 to 2 percent.

The Ambraw soils are commonly adjacent to Shaffton soils and the Wapsie Variant. The Shaffton soils are somewhat poorly drained. The Wapsie Variant has a thinner A horizon than the Ambraw soils have and is well drained. Both soils have a browner B horizon than the Ambraw soils.

Typical pedon of Ambraw silty clay loam, 0 to 2 percent slopes, in a cultivated field on a level and

depressional flood plain; 1,590 feet north and 2,270 feet east of the southwest corner of sec. 11, T. 81. N., R. 1 E.

Ap—0 to 8 inches; black (10YR 2/1) silty clay loam, high in content of sand; weak fine granular structure; friable; slightly acid; abrupt smooth boundary.

A12—8 to 22 inches; very dark gray (10YR 3/1) loam; few fine faint dark brown (7.5YR 3/2) mottles; weak fine granular structure; friable; medium acid; clear smooth boundary.

B2g—22 to 34 inches; dark gray (10YR 4/1) heavy loam; many fine distinct brown (7.5YR 4/4) mottles; weak medium subangular blocky structure; friable; medium acid; gradual smooth boundary.

B31g—34 to 42 inches; gray (10YR 5/1) heavy sandy loam; many fine and medium distinct brown (7.5YR 4/4) mottles; weak coarse subangular blocky structure; friable; medium acid; gradual smooth boundary.

B32g—42 to 47 inches; gray (10YR 5/1) light sandy loam; many fine and medium distinct brown (7.5YR 4/4) mottles; medium acid; gradual smooth boundary.

C1—47 to 54 inches; gray (10YR 5/1) loamy fine sand; few coarse distinct olive brown (2.5Y 4/4) mottles; single grained; very friable; medium acid; gradual smooth boundary.

C2—54 to 60 inches; dark gray (2.5Y 4/0) loamy fine sand; single grained; very friable; medium acid.

The solum ranges from 40 to 60 inches in thickness. The A1 horizon is 16 to 24 inches thick. The Bg horizon has hue of 10YR, 2.5Y, or 5Y; value of 4 or 5; and chroma of 1 or 2. The lower part of the Bg horizon contains strata of loamy sand and sandy loam. Reaction is slightly acid to strongly acid. The C horizon has hue of 10YR, 2.5Y, or 5Y; value of 4 or 5; and chroma of 0 or 1. Hue of 5Y and value of 2 are not common but are allowed in this series. The C horizon is loamy fine sand, sandy loam, or sand.

Ansgar series

The Ansgar series consists of poorly drained, moderately permeable soils on concave toe slopes and at the heads of small drainageways in uplands. These soils formed in 24 to 40 inches of loess and in the underlying glacial till. Slope ranges from 0 to 3 percent.

The Ansgar soils are similar to Maxfield soils. They are commonly adjacent to the Dinsdale and Klinger soils. The Dinsdale soils are well drained. The Klinger soils are somewhat poorly drained. The Dinsdale and Klinger soils have a browner B horizon than the Ansgar soils have. All three soils do not have the A2 horizon characteristics of the Ansgar soils.

Typical pedon of Ansgar silt loam, 0 to 3 percent slopes, in a cultivated field on a northeast-facing concave slope, in an upland cove; 95 feet north and 590 feet west of the southeast corner of sec. 29, T. 82 N., R. 1 E.

Ap—0 to 8 inches; black (10YR 2/1) silt loam; weak fine granular structure; friable; neutral; abrupt smooth boundary.

A2—8 to 16 inches; dark grayish brown (10YR 4/2) silt loam; weak medium platy structure; friable; slightly acid; clear wavy boundary.

B1—16 to 24 inches; grayish brown (10YR 5/2) heavy silt loam; fine faint yellowish brown (10YR 5/6) and few medium distinct dark yellowish brown (10YR 4/4) mottles; weak fine subangular blocky structure; friable; medium acid; gradual smooth boundary.

B2—24 to 33 inches; grayish brown (2.5Y 5/2) silty clay loam; common fine distinct yellowish brown (10YR 5/6) and few fine distinct dark yellowish brown (10YR 4/4) mottles; moderate fine subangular blocky structure; friable; medium acid; gradual smooth boundary.

B31—33 to 39 inches; mottled grayish brown (2.5Y 5/2) and yellowish brown (10YR 5/4) silty clay loam; weak coarse subangular blocky structure; friable; medium acid; abrupt wavy boundary.

IIB32—39 to 49 inches; grayish brown (2.5Y 5/2) loam; common fine distinct yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure; friable; few dark oxides; medium acid; gradual smooth boundary.

IIC—49 to 60 inches; grayish brown (2.5Y 5/2) loam; common fine distinct yellowish brown (10YR 5/8) mottles; massive; friable; few fine dark oxides; medium acid.

The Ap or A1 horizon is black (10YR 2/1) or very dark gray (10YR 3/1) and is 6 to 9 inches thick. The A2 horizon has hue of 10YR, value of 4 or 5, and chroma of 1 or 2. It is 6 to 10 inches thick. The upper part of the B horizon formed in loess. It has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4 and has few to many dark yellowish brown (10YR 4/4) to yellowish brown (10YR 5/8) mottles. The lower part of the B horizon formed in glacial till. It has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 or 2. Reaction in the B horizon is medium or strongly acid.

Aredale series

The Aredale series consists of well drained, moderately permeable soils on convex ridges and side slopes. These soils are in uplands. They formed in 40 to 60 inches of loamy material and in the underlying glacial till. Slope ranges from 2 to 5 percent.

Aredale soils are similar to Kenyon soils and are commonly adjacent to Dickinson, Kenyon, and Olin soils. The Dickinson soils have more sand in the A and B horizons than the Aredale soils have. They are 60 inches or more deep to glacial till. The Kenyon soils are 2 feet

deep to glacial till. The Olin soils have more sand in the upper part of the solum than the Aredale soils. They are 2 to 3 feet deep to glacial till.

Typical pedon of Aredale loam, 2 to 5 percent slopes, in a cultivated field on an east-facing, convex side slope, in uplands; 220 feet south and 560 feet east of the northwest corner of sec. 19, T. 81 N., R. 5 E.

Ap—0 to 7 inches; black (10YR 2/1) loam; weak fine granular structure; friable; neutral; abrupt smooth boundary.
A12—7 to 17 inches; very dark grayish brown (10YR 3/2) loam; weak fine and very fine granular structure; friable; slightly acid; clear smooth boundary.
B21—17 to 25 inches; brown (10YR 4/3) heavy loam, very dark grayish brown (10YR 3/2) coatings on peds; weak fine and very fine subangular blocky structure; friable; medium acid; clear smooth boundary.
B22—25 to 35 inches; dark yellowish brown (10YR 4/4) heavy loam; weak fine and very fine subangular blocky structure; friable; medium acid; clear smooth boundary.
B23—35 to 42 inches; yellowish brown (10YR 5/4) loam; weak medium and fine subangular blocky structure; friable; sandy loam lenses at a depth of 40 to 42 inches; medium acid; clear smooth boundary.
IIB3—42 to 60 inches; yellowish brown (10YR 5/4) loam; common medium distinct grayish brown (2.5Y 5/2) mottles; weak coarse subangular blocky structure; firm; common yellowish brown concretions; slightly acid.

The solum is commonly 4 feet or more thick. Fine loamy glacial till typically is at a depth of about 42 to 60 inches. Some pedons have a layer of sandy loam as much as 10 inches thick between the loamy glacial sediments and the glacial till.

The A1 or Ap horizon is black, (10YR 2/1) very dark brown, (10YR 2/2) or very dark grayish brown (10YR 3/2). The A horizon is loam or silt loam that is high in content of sand. The B2 horizon has hue of 10YR, value of 3 to 5, and chroma of 3 to 6. It is free of mottles that have a low chroma to a depth of about 3 feet. The B2 horizon is typically loam, but the range includes clay loam or sandy clay loam. Reaction in the B horizon ranges from strongly acid to medium acid.

Atterberry series

The Atterberry series consists of somewhat poorly drained, moderately permeable soils on divides, at heads of drainageways, and at the base of slopes in uplands and on loess-covered stream benches. These soils formed in more than 60 inches of loess. Slope ranges from 1 to 3 percent.

Atterberry soils are commonly adjacent to Downs, Muscatine, Tama, and Walford soils. The Downs and Tama soils are well drained and have a browner B horizon than the Atterberry soils. The Muscatine soils do not have an A2 horizon but have a thicker A1 horizon. The Walford soils are poorly drained and have a grayer B horizon than the Atterberry soils.

Typical pedon of Atterberry silt loam, 1 to 3 percent slopes, in a cultivated field on a west-facing, concave head slope, in uplands; 170 feet west and 2,420 feet north of the southeast corner of sec. 36, T. 82 N., R. 5 E.

Ap—0 to 6 inches; black (10YR 2/1) silt loam; weak fine granular structure; friable; neutral; abrupt smooth boundary.
A12—6 to 9 inches; very dark gray (10YR 3/1) heavy silt loam, weak fine subangular blocky structure; friable; slightly acid; abrupt smooth boundary.
A2—9 to 17 inches; dark grayish brown (10YR 4/2) silt loam that has very dark gray (10YR 3/1) coatings on peds; weak medium platy structure; friable; strongly acid; clear wavy boundary.
B1t—17 to 21 inches; brown (10YR 4/3) light silty clay loam; few fine faint yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; friable; thin discontinuous dark grayish brown (10YR 4/2) clay films; strongly acid; clear wavy boundary.
B2t—21 to 38 inches; grayish brown (10YR 5/2) silty clay loam; few fine faint yellowish brown (10YR 5/8) and few fine distinct strong brown (7.5YR 5/6) mottles; weak medium and fine subangular blocky structure; friable; thin discontinuous dark grayish brown (10YR 4/2) clay films; strongly acid; gradual wavy boundary.
B3—38 to 44 inches; grayish brown (10YR 5/2) light silty clay loam; distinct strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; friable; few fine dark oxides; medium acid; gradual wavy boundary.
C—44 to 60 inches; grayish brown (2.5Y 5/2) heavy silt loam; common fine faint yellowish brown (10YR 5/6) mottles; massive; friable; neutral.

The solum ranges from 40 to 60 inches in thickness. The A1 or Ap horizon is black (10YR 2/1), very dark gray (10YR 3/1), or very dark grayish brown (10YR 3/2). It is 6 to 10 inches thick. The A2 horizon is 3 to 8 inches thick. The B2 horizon has hue of 10YR or 2.5Y, value of 4 through 6, and chroma of 2 through 4. It is silty clay loam and ranges in clay content from 29 to 34 percent. The B3 horizon generally has hue of 10YR or 2.5Y, value of 4 through 6, and chroma of 1 or 2. Mottles have a higher chroma. Reaction in the B horizon is medium acid to strongly acid.

Bertram series

The Bertram series consists of somewhat excessively drained, moderately rapidly permeable soils in the

uplands. These soils formed in 20 to 40 inches of sandy loam over limestone bedrock. Slope ranges from 2 to 7 percent.

Bertram soils are commonly adjacent to Dickinson, Ripon, Rockton, and Sogn soils. The Dickinson soils, unlike the Bertram soils, have no limestone bedrock within a depth of 60 inches or more. The Ripon and Rockton soils have a finer texture than the Bertram soils. The Sogn soils are shallower to limestone bedrock than the Bertram soils.

Typical pedon of Bertram sandy loam, 2 to 7 percent slopes, in a permanent pasture on an east-facing, convex ridgetop, in uplands; 610 feet north and 1,235 feet east of the southwest corner of sec. 16, T. 81 N., R. 5 E.

A1—0 to 11 inches; very dark brown (10YR 2/2) sandy loam; very weak medium and fine subangular blocky structure; very friable; neutral; gradual smooth boundary.

A12—11 to 16 inches; very dark grayish brown (10YR 3/2) sandy loam; weak fine subangular blocky structure; very friable; slightly acid; clear smooth boundary.

B21t—16 to 24 inches; brown (10YR 4/3) heavy sandy loam; weak fine and medium subangular blocky structure; friable; thin discontinuous clay films; medium acid; clear wavy boundary.

B22t—24 to 28 inches; brown (10YR 4/3) heavy sandy loam; weak fine subangular blocky structure; friable; thin discontinuous clay films; a few limestone fragments 5 to 20 mm in diameter; medium acid; abrupt wavy boundary.

IIC—28 to 33 inches; light yellowish brown (10YR 6/4) loamy sand; massive; very friable; soft mealy limestone and a few limestone fragments; medium acid; abrupt broken boundary.

IIR—33 inches; hard fractured limestone bedrock.

The solum typically is about 30 inches thick, but it ranges from 20 to 40 inches in thickness. The thickness of the solum and depth to limestone bedrock commonly decreases as slope increases.

The A horizon ranges from 14 to 20 inches in thickness. The B2 horizon ranges in color from dark brown (10YR 3/3) to yellowish brown (10YR 5/4). It is typically sandy loam, but the range includes sandy clay loam. The IIB horizon, or residuum, ranges from 0 to 6 inches in thickness. It is sandy clay loam to clay loam. Reaction in the B horizon ranges from neutral to strongly acid.

Brady series

The Brady series consists of somewhat poorly drained soils on foot slopes in uplands and on stream benches. These soils formed in sands that have been deposited by wind or water or both. Permeability is moderately rapid in the subsoil and very rapid in the substratum. Slope ranges from 1 to 3 percent.

These soils are shallower to loamy sand or coarser textures; have less gravel in the solum, and much less gravel within a depth of 60 inches; and have a thinner solum than is defined as range of the Brady series. These differences do not alter the usefulness and behavior of these soils.

Brady soils are commonly adjacent to Granby, Dickinson, and Sparta soils in the landscape. Granby soils are poorly drained and have a grayer B horizon than the Brady soils. They are at lower positions in the landscape. Dickinson soils are somewhat excessively drained and do not have an A2 horizon. Sparta soils are excessively drained and have more sand in the A and B horizons than Brady soils. The Dickinson soils have a browner B horizon than the Brady soils.

Typical pedon of Brady sandy loam, 1 to 3 percent slopes, in a cultivated field on a north-facing stream bench; 1,720 feet west and 770 feet south of the northeast corner of sec. 7, T. 82 N., R. 1 E.

Ap—0 to 8 inches; very dark brown (10YR 2/2) sandy loam; weak fine granular structure; very friable; neutral; abrupt smooth boundary.

A2—8 to 12 inches; dark grayish brown (10YR 4/2) sandy loam; weak medium platy structure; very friable; few fine dark brown (7.5YR 3/2) oxide concretions; neutral; clear smooth boundary.

B1—12 to 18 inches; brown (10YR 4/3) sandy loam; weak medium subangular blocky structure; very friable; slightly acid; gradual smooth boundary.

B2t—18 to 25 inches; strong brown (7.5YR 5/6) and grayish brown (2.5Y 5/2) sandy loam; moderate medium subangular blocky structure; very friable; clay bridging between sand grains; slightly acid; gradual smooth boundary.

B3—25 to 35 inches; light brownish gray (2.5Y 6/2) loamy sand; common fine distinct strong brown (7.5YR 5/6) mottles; weak coarse subangular blocky structure; very friable; slightly acid; gradual smooth boundary.

C1—35 to 42 inches; light brownish gray (2.5Y 6/2) and light gray (2.5Y 7/2) sand; common fine distinct strong brown (7.5YR 5/6) mottles; single grained; loose; medium acid; gradual smooth boundary.

C2—42 to 45 inches; dark yellowish brown (10YR 4/4) coarse sand; few fine distinct strong brown (7.5YR 5/6) mottles; single grained; loose; medium acid; gradual smooth boundary.

C3—45 to 60 inches; light brownish gray (2.5Y 6/2) fine sand; single grained; loose; medium acid.

The solum ranges from 24 to 40 inches in thickness. The A1 horizon is 6 to 10 inches thick. It has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The A2 horizon is 3 to 6 inches thick. It has hue of 10YR; value of 4 or 5; and chroma of 1, 2, or 3. The B horizon is 18

to 30 inches thick. It has hue of 7.5YR, 10YR, and 2.5Y; value of 4, 5, or 6; and chroma of 2 through 6. Where this horizon has chroma of 3, 4, 5, or 6, mottles have a lower chroma. The B horizon ranges from sandy loam in the upper part to loamy fine sand in the lower part. Reaction in the B horizon ranges from neutral to medium acid. The C horizon is fine sand to coarse, stratified sand. Some strata are hue of 2.5Y; value of 5, 6, or 7; and chroma of 2 or 3. Other strata are hue of 10YR; value of 3, 4, or 5; and chroma of 3, 4, or 5.

Burkhardt series

The Burkhardt series consists of excessively drained soils on stream benches and on outwash plains of uplands. These soils formed in 12 to 24 inches of sandy loam and in the underlying loamy sand, which is over sand and gravel. Permeability is moderately rapid in the solum and rapid in the underlying material. Slope ranges from 2 to 25 percent.

The Burkhardt soils are similar to Flagler soils and are commonly adjacent to Flagler, Saude, and Waukegan soils. The Flagler soils are underlain by sand and gravel at a depth of 24 to 40 inches. The Saude soils are loamy in the upper 2 feet. The Waukegan soils are silty above the sand and gravel, which is at a depth of 2 to 3 feet.

Typical pedon of Burkhardt sandy loam, 2 to 5 percent slopes, in a cultivated field on an outwash plain, in uplands; 1,545 feet south and 441 feet east of the northwest corner of sec. 10, T. 81 N., R. 3 E.

Ap—0 to 8 inches; very dark brown (10YR 2/2) sandy loam; weak fine granular structure; very friable; 2 to 3 percent fine gravel; neutral; clear smooth boundary.

A12—8 to 14 inches; very dark grayish brown (10YR 3/2) sandy loam; weak fine subangular blocky structure parting to weak fine granular; very friable; 2 to 3 percent fine gravel; slightly acid; clear smooth boundary.

B2—14 to 20 inches; brown (10YR 4/3) sandy loam; weak medium subangular blocky structure; very friable; 2 to 5 percent fine gravel; dark brown (10YR 3/3) coatings on peds; slightly acid; gradual smooth boundary.

B3—20 to 23 inches; dark yellowish brown (10YR 4/4) loamy sand; weak medium subangular blocky structure; very friable; 5 percent fine gravel; slightly acid; gradual smooth boundary.

IIC1—23 to 35 inches; dark yellowish brown (10YR 4/4) coarse sand; single grained; loose; 10 to 15 percent gravel; slightly acid; gradual smooth boundary.

IIC2—35 to 60 inches; yellowish brown (10YR 5/6) coarse sand; single grained; loose; 20 percent gravel; slightly acid.

The solum typicaly is 14 to 24 inches thick but can be as thin as 12 inches. The B horizon is hue of 10YR or 7.5YR, value of 2 or 4, and chroma of 3 or 4. The reaction in the B horizon is medium acid to slightly acid. The IIC horizon is hue of 10YR or 7.5YR, value of 4 or 5, and chroma 4 to 6. It is sand or gravelly sand.

Calco series

The Calco series consists of poorly drained, moderately permeable soils on bottom lands and low benches along streams. These soils formed in alluvial, calcareous deposits. Slope ranges from 0 to 2 percent.

These soils have a higher calcium carbonate equivalent in the upper part of the solum, have a thinner mollic epipedon, and have more loamy sand in the lower part of the C horizon above a depth of 60 inches than is defined as the range for the Calco series. These differences do not alter their usefulness and behavior.

The Calco soils are commonly adjacent to Colo and Elvira soils. The Colo and Elvira soils have lower calcium carbonate in the A and B horizon than the Calco soils have. The Elvira soils have high concentrations of iron and manganese in the A and B horizons.

Typical pedon of Calco silty clay loam, 0 to 2 percent slopes, in a cultivated field on a north-facing, nearly level flood plain; 1,314 feet west and 300 feet south of the northeast corner of sec. 2, T. 82 N., R. 1 E.

Apca—0 to 8 inches; black (10YR 2/1) silty clay loam; weak fine granular structure; friable; common shell fragments; strong effervescence; moderately alkaline; abrupt smooth boundary.

A12ca—8 to 19 inches; black (10YR 2/1) silty clay loam; weak fine granular structure; firm; common shell fragments; strong effervescence; moderately alkaline; gradual smooth boundary.

B1—19 to 29 inches; very dark gray (10YR 3/1) silty clay loam; common fine faint brown (10YR 4/3) mottles; moderate fine and medium angular blocky structure; firm; strong effervescence; moderately alkaline; gradual smooth boundary.

B2—29 to 34 inches; very dark gray (10YR 3/1) silty clay loam; moderate medium angular blocky structure; firm; strong effervescence; moderately alkaline; gradual smooth boundary.

B3—34 to 44 inches; light olive brown (2.5Y 5/6) silty clay loam; many fine faint grayish brown (10YR 5/2) mottles; massive; vertical cleavage; firm; slight effervescence; mildly alkaline; clear wavy boundary.

C1—44 to 52 inches; gray (5Y 5/1) light silty clay loam; massive; vertical cleavage; friable; many 1 to 2 mm shell fragments; violent effervescence; moderately alkaline; abrupt wavy boundary.

IIC2—52 to 60 inches; grayish brown (2.5Y 5/2) loamy sand; single grained; loose; strong effervescence; moderately alkaline.

The solum is typically more than 36 inches thick. It has a calcium carbonate equivalent of 12 to 37 percent.

The A horizon is black (10YR 2/1 or N 2/0) in the upper part and grades to very dark gray (10YR 3/1) in the lower part. It is typically silty clay loam, but in some pedons it can be silt loam. The B horizon ranges in hue of 10YR, 2.5Y, or 5Y; value of 3 or more; and chroma of 0 or 1. It is dominantly silty clay loam, but it can be silt loam or loam in the lower part. It contains less calcium carbonate than the A or C horizons. The C horizon is silty clay loam, silt loam, or loam. In some pedons loamy sand or sandy loam is at a depth of 50 inches or more. The sand content in most pedons is commonly less than 15 percent in the upper 40 inches, but sand content as high as 23 percent is within the range. The reaction throughout the solum is mildly alkaline or moderately alkaline.

Chaseburg series

The Chaseburg series consists of moderately well drained, moderately permeable soils on flood plains, on alluvial fans, and in narrow drainageways in uplands. These soils formed in recently deposited, silty alluvium. Slope ranges from 0 to 5 percent.

The Chaseburg soils are commonly adjacent to Elvers and Colo soils and are downslope from Fayette soils. The Elvers soils have organic layers at a depth of about 3 feet. The Colo soils are silty clay loam and are poorly drained. The Fayette soils, located in the uplands, are well drained. The Colo soils have a grayer B horizon than the Chaseburg soils, and the Fayette soils have a browner one.

Typical pedon of Chaseburg silt loam, 0 to 2 percent slopes, in a permanent pasture on a flood plain; 880 feet south and 770 feet east of the northwest corner of Sec. 4, T. 83 N, R. 1 E.

A—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; friable; neutral; clear wavy boundary.

C—7 to 60 inches; stratified dark grayish brown (10YR 4/2), brown (10YR 4/3), grayish brown (10YR 5/2), and brown (10YR 5/3) silt loam; weak coarse platy structure; friable; few fine dark brown (7.5YR 3/2) oxides in lower part; neutral.

The A or Ap horizon is 4 to 10 inches thick. The A horizon is hue of 10YR, value of 3 or 4, and chroma of 1 or 2. The dominant color of the underlying C horizon is 10YR 4/2. Some strata have hue of 10YR; value of 4 or 5; and chroma of 2, 3, or 4, which are within the range of the series. Strata that have colors of 10YR 2/1, 3/1, or 3/2 are not excluded if they are not part of a buried soil. The C horizon is mainly silt loam, but strata of silty clay loam and loam or thin strata of sandy loam are allowed. The strata of sandy loam are usually below a depth of 40 inches. Reaction throughout the solum is slightly acid to neutral.

Chelsea series

The Chelsea series consists of excessively drained, rapidly permeable soils on uplands and on high benches along streams. These soils formed in sands that have been deposited predominantly by wind. Slope ranges from 5 to 30 percent.

Chelsea soils are similar to Finchford and Sparta soils and are commonly adjacent to Fayette and Lamont soils in the landscape. Finchford soils have considerable amounts of coarse and medium sand. Sparta soils have a darker and thicker A1 horizon but do not have an A2 horizon. Fayette soils, formed in loess, are silty. Lamont soils have less sand in the A and B horizons.

Tyipcal pedon of Chelsea loamy fine sand, 9 to 18 percent slopes, in a hayfield on a southeast-facing, convex ridgetop; 414 feet west and 540 feet south of the northeast corner of sec. 24, T. 81 N., R. 1 E.

Ap—0 to 7 inches; dark brown (10YR 3/3) loamy fine sand, light brownish gray (10YR 6/2) dry; weak medium subangular blocky structure; very friable; neutral; abrupt smooth boundary.

A21—7 to 12 inches; dark yellowish brown (10YR 4/4) loamy fine sand; weak medium subangular blocky structure; very friable; meidum acid; gradual wavy boundary.

A22—12 to 34 inches; yellowish brown (10YR 5/4) fine sand; single grained; loose; thin loamy sand band at a depth of 33 inches; medium acid; gradual smooth boundary.

A&B—34 to 50 inches; light yellowish brown (10YR 6/4) fine sand; single grained; loose; few thin loamy sand bands at 44 and 50 inches; medium acid; gradual wavy boundary.

C1—50 to 58 inches; yellowish brown (10YR 5/4) fine sand; single grained; loose; medium acid; gradual wavy boundary.

C2—58 to 60 inches; light yellowish brown (10YR 6/4) fine sand; single grained; loose; medium acid.

The A1 horizon is very dark gray (10YR 3/1) or very dark grayish brown (10YR 3/2). The Ap horizon ranges in color from hue of 10YR, value of 4 or 3, and chroma of 2 or 3. The A horizon is typically loamy fine sand, but in places it is fine sand. The A & B horizon has lamellae 1/4 inch to 2 inches thick. The lamellae are the B horizon part of the A & B horizon. They have hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 3 or 4. The lamellae are loamy sand or sandy loam. The upper most lamellae are at a depth of about 36 inches but range in depth from 27 to 48 inches. The C horizon is hue of 10YR, value of 4 to 6, and chroma of 3 or 4. The reaction in the B and C horizons is medium or strongly acid.

Clyde series

The Clyde series consists of poorly drained, moderately permeable soils in drainageways and lower, concave positions on glacial uplands. These soils formed in loamy material and in the glacial till that is at a depth of 30 to 50 inches. Slope ranges from 0 to 2 percent

The Clyde soils are commonly adjacent to Colo, Kenyon, and Schley soils. The Colo soils, unlike the Clyde soils, formed in silty alluvium and are not underlain by glacial till within a depth of 5 feet. The Kenyon soils are moderately well drained and have glacial till at 2 feet. The Schley soils are somewhat poorly drained. The Kenyon and Schley soils have a browner B horizon than the Clyde soils.

Typical pedon of Clyde silty clay loam, 0 to 2 percent slopes, in a cultivated field on a southwest-facing, concave slope; 85 feet south and 1,296 feet west of the northeast corner of sec. 6, T. 82 N., R. 1 E.

Ap—0 to 7 inches; black (N 2/0) light silty clay loam, high in content of sand; weak fine granular structure; friable; neutral; abrupt smooth boundary.

A12—7 to 18 inches; black (N 2/0) light silty clay loam high in content of sand; weak fine granular structure; friable; neutral; clear smooth boundary.

B1—18 to 27 inches; grayish brown (2.5Y 5/2) loam; weak medium and fine subangular blocky structure; friable; common fine yellowish brown (10YR 5/6) mottles; neutral; clear smooth boundary.

B21—27 to 35 inches; gray (5Y 5/1) light clay loam; weak medium and fine subangular blocky structure; friable; neutral; clear wavy boundary.

B22—35 to 43 inches; light gray (5Y 6/1) loam; common fine distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; sandy loam lenses at 40 to 42 inches; neutral; clear wavy boundary.

IIB3—43 to 60 inches; mottled light olive gray (5Y 6/2) and brownish yellow (10YR 6/2) heavy loam; weak coarse prismatic structure; firm; neutral.

The solum is typically more than 42 inches thick but ranges from 30 to 60 inches or more in thickness. Erosional sediment is typically 36 to 42 inches deep to glacial till but ranges in depth from 30 to 50 inches.

The A horizon ranges from about 18 to 24 inches in thickness. Texture ranges from silty clay loam that is high in content of sand or clay loam to silt loam that is high in content of sand or loam. The B horizon is clay loam or loam. In some places it has strata of silty clay loam and layers of sandy loam, typically less than 6 inches thick, which are within the range of the series. Reaction is typically neutral throughout.

Colo series

The Colo series consists of poorly drained, moderately permeable soils on flood plains and in drainageways in uplands. These soils formed in silty, alluvial deposits. Slope ranges from 0 to 2 percent.

The Colo soils are similar to Sawmill soils and are commonly adjacent to Elvira, Sawmill, and Zook soils. The Elvira soils have high concentrations of iron and manganese in the B horizon, and some accumulation in the A horizon. The Sawmill soils have a thinner A1 horizon than the Colo soils. The Zook soils have heavier textures in the B horizon.

Typical pedon of Colo silty clay loam, 0 to 2 percent slopes, in a cultivated field on a nearly level, low bench; 2,170 feet south and 700 feet east of the northwest corner of sec. 10, T. 82 N., R. 5 E.

Ap—0 to 10 inches; black (10YR 2/1) light silty clay loam; weak fine subangular blocky structure parting to weak fine granular; friable; slightly acid; abrupt smooth boundary.

A12—10 to 18 inches; black (N 2/0) silty clay loam; moderate fine granular and moderate very fine subangular blocky structure; friable; neutral; gradual smooth boundary.

A13—18 to 25 inches; black (N 2/0) silty clay loam; weak fine subangular blocky structure; friable; neutral; gradual smooth boundary.

A14—25 to 38 inches; black (10YR 2/1) silty clay loam; weak fine subangular structure; friable; neutral; gradual smooth boundary.

C1g—38 to 47 inches; very dark gray (5Y 3/1) light silty clay loam with 15 percent black (10YR 2/1) coatings on peds; few fine faint dark grayish brown (2.5Y 4/2) mottles; weak fine prismatic structure parting to moderate fine subangular blocky; friable; few dark krotovina; few fine magnesium and iron oxides; neutral; gradual smooth boundary.

C2g—47 to 60 inches; dark gray (5Y 4/1) and olive gray (5Y 5/2) light silty clay loam; massive; some vertical cleavage; few fine dark krotovina; friable; neutral.

The solum ranges from 36 inches to about 50 inches in thickness. The A horizon is typically black (10YR 2/1, N 2/0) or very dark gray (10YR 3/1). It is hue of 2.5Y or 10YR, value of 2 or 3, and chroma of 0 or 1. The A horizon is silty clay loam and ranges in content of clay from 27 to 32 percent. Thin layers have a clay content as high as 35 percent. The A horizon has hue of 2 or 3 to a depth of 36 inches or more. The C horizon has hue of 2.5Y or 5Y, value of 3 to 5, and chroma of 1 or 2. Few or commom, high-chroma mottles are in some places. The soils that have sandy or gravelly horizons below 4 feet are within the range of the series. Soil reaction throughout the solum is from slightly acid to neutral.

Coyne series

The Coyne series consists of well drained, moderately rapidly permeable and moderately permeable soils on

terraces along the Mississippi River and its tributaries. These soils formed in 30 to 60 inches of sandy loam material and in the underlying, reddish, loamy, lacustrine deposits. Slope ranges from 0 to 2 percent.

These soils formed in thinner, sandy loam deposits and contain slightly more clay in the 10-to 40-inch control section than is the defined as the range for the Coyne series, but these differences do not alter the usefulness and behavior of these soils.

The Coyne soils are commonly adjacent to the Darwin Variant and Udolpho and Zwingle soils. The Darwin Variant has finer textures in the A and B horizons and is underlain by limestone at 2 feet. The Udolpho soils are somewhat poorly drained and have a grayer B horizon than the Coyne soils. The Zwingle soils have a silty clay or clay B horizon.

Typical pedon from an area of Coyne fine sandy loam, 0 to 2 percent slopes, in a cultivated field on a northwest-facing, convex slope, on a high terrace along a stream; 2,280 feet south and 1,840 feet west of the northeast corner of sec. 22, T. 81 N., R. 6 E.

Ap—0 to 7 inches; very dark brown (10YR 2/2) fine sandy loam; weak medium and fine subangular blocky structure; friable; slightly acid; abrupt smooth boundary.

A12—7 to 14 inches; very dark brown (10YR 2/2) fine sandy loam; weak fine and medium subangular blocky structure; friable; medium acid; clear smooth boundary.

A13—14 to 21 inches; dark brown (10YR 3/3) fine sandy loam; weak medium subangular blocky structure; friable; medium acid; clear wavy boundary.

IIB1—21 to 32 inches; dark reddish brown (5YR 3/4) loam; weak medium subangular blocky structure parting to weak fine subangular blocky; friable; medium acid; gradual smooth boundary.

B2—32 to 48 inches; dark reddish brown (5YR 3/4) silt loam; many fine distinct olive brown (2.5Y 4/4), few fine distinct brown (7.5YR 4/4, 10YR 5/3) mottles; weak medium subangular blocky structure; friable; slightly acid; abrupt broken boundary.

B3—48 to 55 inches; yellowish brown (10YR 5/6) loam; many fine distinct olive brown (2.5Y 4/4), few fine distinct brown (7.5YR 4/4), and few fine faint brown (10YR 5/3) mottles; weak medium subangular blocky structure; friable; neutral.

IIIC—55 to 60 inches; brown (7.5YR 4/4) sand; single grained; loose; 2 to 5 percent gravel; neutral.

The solum ranges from 48 to 60 inches in thickness. The A horizon is very dark gray (10YR 3/1), very dark brown (10YR 2/2), very dark grayish brown (10YR 3/2) or dark brown (10YR 3/3). It is typically fine sandy loam but can include loamy sand. The B horizon is hue of 10YR, 7.5YR, or 5YR; value of 3 to 5; and chroma of 3 to 6. The reaction in the B horizon is medium acid to neutral. The IIIC horizon is sand and fine gravel, but some pedons have strata of loam or silt loam.

Darwin series

The Darwin series consists of very poorly drained, very slowly permeable soils on flood plains of the Mississippi River. They formed in clayey and silty alluvium derived from lacustrine deposits. Slope ranges from 0 to 2 percent.

The Darwin soils are commonly adjacent to the Medary and Zwingle soils. The Medary and Zwingle soils have a thinner A horizon than the Darwin soils. They are on high benches along streams.

Typical pedon of Darwin silty clay, bedrock substratum, 0 to 2 percent slopes, in a cultivated field on a level, high terrace along streams; 940 feet north and 940 feet west of the southeast corner of sec. 1, T. 80 N., R. 5 E.

Ap—0 to 7 inches; black (N 2/0) light silty clay; weak fine granular structure; firm; mildly alkaline; abrupt smooth boundary.

A12—7 to 12 inches; black (N 2/0) silty clay; moderate fine granular structure; firm; mildly alkaline; clear smooth boundary.

B21—12 to 18 inches; black (5Y 2/1) clay; moderate fine granular structure; firm; mildly alkaline; clear smooth boundary.

B22—18 to 23 inches; black (5Y 2/1) clay; moderate fine and medium angular blocky structure; firm mildly alkaline, clear smooth boundary.

B23—23 to 28 inches; olive gray (5Y 4/2) clay; moderate fine and medium angular blocky structure; firm; mildly alkaline; clear smooth boundary.

B3—28 to 36 inches; mottled olive gray (5Y 5/2) olive (5Y 5/3) and yellowish brown (10YR 5/6) silty clay; weak medium angular blocky structure; firm; mildly alkaline; gradual smooth boundary.

C—36 to 48 inches; mottled olive gray (5Y 5/2) and yellowish brown (10YR 5/6) heavy silty clay loam; massive; firm; mildly alkaline.

IIR—48 inches; fractured limestone bedrock and clayey material between flags of limestone.

The solum ranges from 32 to 45 inches in thickness. The A horizon is black (10YR 2/1 or N 2/0). It is silty clay, but texture can range to silty clay loam. The B horizon is hue of 5Y, 2.5Y, or 10YR; value of 2 to 5; and chroma of 2 to 6. The C horizon is typically silty clay loam, but silty clay is in some pedons.

Darwin Variant

The Darwin Variant consists of poorly drained, very slowly permeable soils on low benches along the Mississippi River and its tributaries. These soils formed in 20 to 40 inches of lacustrine sediments over limestone bedrock. Slope ranges 0 to 2 percent.

The Darwin Variant is commonly adjacent to Darwin and Zwingle soils. The Darwin soils have a thicker A1 horizon and a grayer B horizon than the Darwin Variant.

Limestone bedrock is below a depth of 40 inches. The Zwingle soils, unlike the Darwin Variant, do not have limestone bedrock within a depth of 5 feet or more.

Typical pedon of Darwin Variant silty clay, 0 to 2 percent slopes, in an uncultivated field on a high bench along a stream; 123 feet east and 2,515 feet north of the southwest corner of sec. 32, T. 81 N., R. 6 E.

Ap—0 to 9 inches; black (10YR 2/1) silty clay; cloddy; firm; neutral; abrupt smooth boundary.

A3—9 to 15 inches; very dark gray (10YR 3/1) clay; moderate medium subangular blocky structure; very firm; slightly acid; clear wavy boundary.

B2—15 to 20 inches; dark reddish brown (5YR 3/4) clay; common fine faint dark brown (7.5YR 3/2) mottles; moderate fine subangular blocky structure; very firm; neutral; abrupt broken boundary.

IIR—20 inches; fractured limestone bedrock and clayey material between flags of limestone.

The thickness of the solum and depth to bedrock typically ranges from 20 to 30 inches. The A horizon is typically silty clay but includes clay in the lower part. The B horizon has hue of 7.5YR or 5YR, value of 3 to 5, and chroma of 2 to 4. The B horizon is typically clay, but silty clay loam is in some pedons. The reaction in the B horizon is neutral or slightly acid.

Dickinson series

The Dickinson series consists of somewhat excessively drained soils in uplands and on benches along streams. These soils formed in material deposited predominantly by wind. Permeability is moderately rapid in the upper part of the profile and either rapid or moderate in the lower part. Slope ranges from 0 to 18 percent.

Dickinson soils are similar to Lamont soils and are commonly adjacent to Udolpho, Saude, and Sparta soils in the landscape. Lamont soils have a thinner, lighter colored A horizon than the Dickinson soils. Sparta soils have more sand in the A and B horizons. Udolpho soils have a light colored A2 horizon. Both Udolpho and Saude soils have finer textured A and B horizons than the Dickinson soils and sand and gravel at a depth of 2 feet.

Typical pedon of Dickinson fine sandy loam, 0 to 2 percent slopes, in a cultivated field on a nearly level, low ridge, in uplands; 89 feet east and 910 feet north of the southwest corner of sec. 31, T. 83 N., R. 1 E.

Ap—0 to 7 inches; very dark brown (10YR 2/2) fine sandy loam, grayish brown (10YR 5/2) dry; weak fine granular structure; very friable; neutral; abrupt smooth boundary.

A12—7 to 14 inches; very dark brown (10YR 2/2) fine sandy loam, dark grayish brown (10YR 4/2) dry; weak fine subangular blocky structure; very friable; neutral; clear smooth boundary.

A13—14 to 19 inches; very dark grayish brown (10YR 3/2) fine sandy loam, dark grayish brown (10YR 4/2) dry; weak fine subangular blocky structure; very friable; neutral; gradual smooth boundary.

B2—19 to 28 inches; brown (10YR 4/3) fine sandy loam; weak medium subangular blocky structure; very friable slightly acid; gradual smooth boundary.

B31—28 to 35 inches; brown (10YR 4/3) loamy sand; weak medium subangular blocky structure; very friable; strongly acid; gradual wavy boundary.

B32—35 to 42 inches; yellowish brown (10YR 5/4) sand; weak medium prismatic structure; very friable; strongly acid; gradual smooth boundary.

C—42 to 60 inches; yellowish brown (10YR 5/6) sand; single grained; very friable; 1/4 to 1 inch brown (7.5YR 4/4) sandy loam bands at 43, 51, and 57 inches; medium acid.

The solum ranges from 24 to 42 inches in thickness. The A horizon is 10 to 20 inches thick. It has hue of 10YR, value of 2 to 3, and chroma of 1 and 2. The B horizon ranges in color from dark brown (10YR 3/3) to brown (10YR 4/3) in the upper part and from dark yellowish brown (10YR 4/4) to yellowish brown (10YR 5/4-5/6) in the lower part. Reaction in the B horizon ranges from slightly acid to strongly acid. The C horizon is yellowish brown (10YR 5/4 to 10YR 5/6). It ranges from loamy sand to fine sand. In some pedons it has few lamellae of sandy loam or loamy sand 1/4 to 1 inch thick.

Dinsdale series

The Dinsdale series consists of well drained, moderately permeable soils on convex ridges and side slopes in uplands. These soils formed in 24 to 40 inches of loess and in the underlying glacial till. Slope ranges from 2 to 9 percent.

The Dinsdale soils are commonly adjacent to Kenyon, Klinger, and Tama soils. The Kenyon soils are loam in the A and B horizons. They are shallower to glacial till than the Dinsdale soils. The Klinger soils are somewhat poorly drained and have a grayer B horizon. The Tama soils, unlike the Dinsdale soils, do not have glacial till within a depth of 60 inches.

Typical pedon of Dinsdale silt loam, 2 to 5 percent slopes, in a meadow on a north-facing, convex slope, in uplands; 772 feet west and 2,475 feet south of the northeast corner of sec. 30, T. 83 N., R. 1 E.

Ap—0 to 7 inches; black (10YR 2/1) heavy silt loam, weak fine granular structure; friable; neutral; clear smooth boundary.

A12—7 to 12 inches; very dark brown (10YR 2/2) light silty clay loam; weak fine subangular blocky structure; friable; neutral; clear smooth boundary.

A3—12 to 18 inches; very dark grayish brown (10YR 3/2) silty clay loam; weak fine subangular blocky structure; friable; neutral; clear smooth boundary.

B21t—18 to 26 inches; brown (10YR 4/3) silty clay loam; moderate fine and medium subangular blocky structure; friable; thin discontinuous clay films; slightly acid; gradual smooth boundary.

B22t—26 to 35 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium subangular blocky structure; friable; thin discontinuous clay films; medium acid; clear smooth boundary.

IIB31—35 to 43 inches; yellowish brown (10YR 5/6) sandy clay loam; few fine faint grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; friable; medium acid; abrupt smooth boundary.

IIB32—43 to 50 inches; yellowish brown (10YR 5/4) loam; few fine faint grayish brown (10YR 5/2) mottles; weak medium prismatic structure; firm; medium acid; gradual smooth boundary.

IIC—50 to 60 inches; yellowish brown (10YR 5/6) loam; few fine faint grayish brown (10YR 5/2) mottles; massive; firm; slightly acid.

The A horizon is 10 to 20 inches thick. The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The B horizon, in the loess, is hue of 10YR, value of 3 or 4, and chroma of 3 or 4. Reaction in the B horizon is slightly acid or medium acid. The IIB horizon and IIC horizon developed in glacial till. The IIB and IIC horizons have hue of 10YR, value of 4 to 5, and chroma of 4 to 8. They contain few to common grayish brown (10YR 5/2) mottles. In places a layer of sandy loam or loamy sand, as much as 10 inches thick, is between the loess and the glacial till.

Downs series

The Downs series consists of well drained, moderately permeable soils on ridges and side slopes. These soils are in uplands. They formed in loess more than 60 inches thick. Slope ranges from 0 to 18 percent.

Downs soils are similar to Tama soils and are commonly adjacent to Atterberry and Gara soils. The Atterberry soils are somewhat poorly drained and have a grayer B horizon than the Downs soils. The Gara soils formed in glacial till. The Atterberry and Tama soils have a thicker A1 horizon than the Downs soils have.

Typical pedon of Downs silt loam, 2 to 5 percent slopes, in a cultivated field on a west-facing, convex slope of a ridge, in uplands; 230 feet north and 1,125 feet west of the southeast corner of sec. 30, T. 82 N., R. 6 E.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam; moderate fine granular structure; friable; slightly acid; abrupt smooth boundary.

A2—8 to 12 inches; brown (10YR 4/3) silt loam; very weak thin platy structure parting to weak fine granular; friable; very dark grayish brown (10YR 3/2) clay films; medium acid; clear smooth boundary.

B21t—12 to 19 inches; brown (10YR 4/3) light silty clay loam; moderate fine subangular blocky structure; friable; thin discontinuous very dark grayish brown (10YR 3/2) clay films; medium acid; clear smooth boundary.

B22t—19 to 27 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate, fine and very fine angular and subangular blocky structure; friable; thin discontinuous dark brown (10YR 3/3) clay films; medium acid; clear smooth boundary.

B23t—27 to 36 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium subangular blocky structure; friable; patchy clay films; thin discontinuous silt coats; medium acid; gradual smooth boundary.

B31t—36 to 43 inches; yellowish brown (10YR 5/4) light silty clay loam; weak medium subangular blocky structure; friable; thin discontinuous silt coatings on faces on peds; medium acid; gradual smooth boundary.

B32t—43 to 54 inches; yellowish brown (10YR 5/4) silt loam; weak medium prismatic structure; friable; thin discontinuous clay films; friable; thin discontinuous silt coatings on faces of peds; strongly acid; gradual smooth boundary.

C—54 to 60 inches; yellowish brown (10YR 5/4) silt loam; few medium faint grayish brown (10YR 5/2) mottles; massive; friable; medium acid.

The solum ranges from 50 to 70 inches in thickness. The A1 horizon is very dark gray (10YR 3/1) or very dark grayish brown (10YR 3/2). It is 6 to 10 inches thick. The A2 horizon ranges in color from dark grayish brown (10YR 4/2) to brown (10YR 5/3). It is 2 to 4 inches thick. In some areas the A2 horizon is incorporated wholly into the Ap horizon. The upper part of the B horizon is dark brown (10YR 3/3) or brown (10YR 4/3). It grades with depth to value of 4 or 5 and chroma 4 to 6. The B horizon is free of mottles that have low chroma to a depth of 30 inches or more. It is silty clay loam that has a clay content ranging from 27 to 34 percent. Reaction in the B horizon ranges from medium acid to strongly acid.

Elvers series

The Elvers series consists of poorly drained, moderately permeable soils that are on alluvial flood plains and at the margins of organic soil adjacent to mineral soils in uplands. These soils formed in recently deposited, silty alluvium over organic material. Slope ranges 0 to 2 percent.

The Elvers soils are adjecent to Chaseburg and Palms soils. The Chaseburg soils, unlike the Elvers soils, do not have the underlying organic material within a depth of 60 inches or more. The Palms soils do not have the stratified, silty alluvium on the surface that the Elvers soils have.

Typical pedon of Elvers silt loam, 0 to 2 percent slopes, in a cultivated field on a level flood plain; 220 feet west and 2,560 feet north of the southeast corner of sec. 16, T. 83 N., R 5 E.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam mixed with grayish brown (10YR 5/2); weak fine subangular blocky structure; friable; common fine roots; slightly acid; abrupt smooth boundary.

C1—7 to 22 inches; stratified dark grayish brown (10YR 4/2) and grayish brown (10YR 5/2) silt loam; weak coarse platy structure; friable; few fine soft dark brown (7.5YR 4/4) oxides; slightly acid; clear wavy boundary.

C2—22 to 35 inches; dark grayish brown (10YR 4/2) silt loam; common fine distinct dark brown (7.5YR 4/4) mottles; weak coarse platy structure; friable; grayish brown (10YR 5/2) strata; slightly acid; gradual irregular boundary.

IIOa—35 to 55 inches; black (N 2/0) sapric material; very weak coarse platy structure; friable; stratified medium acid; abrupt wavy boundary.

IIIC—55 to 60 inches; dark greenish gray (5G 4/1) silt loam; few fine distinct light olive (2.5Y 5/4) mottles; weak coarse platy structure; firm; neutral.

The silty mineral soil over organic material ranges from 20 to 36 inches in thickness. The organic layer is at least 20 inches thick.

The Ap or A1 horizon is very dark grayish brown (10YR 3/2) or dark grayish brown (10YR 4/2). The C horizon has hue of 10YR, value of 4 or 5, and chroma of 1 or 2. The IIO horizon usually consists of sapric (Oa) material. Reaction ranges from medium acid to neutral in the upper mineral layers and the underlying organic layers.

Elvira series

The Elvira series consists of poorly drained, moderately permeable soils on flood plains and terraces along streams. These soils formed in silty, alluvial sediments that commonly overlay stratified, loamy or sandy sediments that are below a depth of 40 inches. Slope ranges from 0 to 2 percent.

The Elvira soils are commonly adjacent to Ambraw, Colo, Sawmill, and Zook soils. The Ambraw soils have a loamy texture in the A and B horizons. The Ambraw, Colo, Sawmill, and Zook soils do not have a high concentration of iron and manganese in the A and B horizons.

Typical pedon of Elvira silty clay loam, 0 to 2 percent slopes, in a cultivated field on a nearly level swale, on the flood plain; 2,230 feet north and 1,580 feet east of the southwest corner of sec. 22, T. 82 N., R. 5 E.

Ap—0 to 7 inches; black (10YR 2/1) silty clay loam; weak medium angular and subangular blocky structure; firm; medium acid; clear smooth boundary.

A12—7 to 15 inches; black (N 2/0) silty clay loam; moderate medium subangular blocky structure; firm; many worm holes and root channels that have dark reddish brown (5YR 3/3) stains; common fine soft dark red (2.5YR 3/6) oxides; medium acid; clear wavy boundary.

B1g—15 to 21 inches; dark gray (10YR 4/1) light silty clay loam; moderate medium subangular blocky structure; firm; many root channels that have reddish brown (5YR 4/3) stains; common fine soft dark red (2.5YR 3/6) oxides; slightly acid; clear wavy boundary.

B21g—21 to 28 inches; dark gray (5Y 4/1) light silty clay loam; moderate fine subangular blocky structure; firm; many fine soft reddish brown (5Y 4/4) and dark red (2.5YR 3/6) oxides; slightly acid; clear irregular boundary.

B22—28 to 33 inches; yellowish red (5YR 4/6) light silty clay loam; moderate very fine subangular blocky structure; firm; sticky when wet, hard when dry; slightly acid; clear irregular boundary.

B3g—33 to 39 inches; mottled gray (5Y 5/1) and yellowish red (5YR 5/6) silty clay loam; common fine distinct yellowish red (5YR 4/6) mottles; weak coarse prismatic structure; firm; black (10YR 2/1) krotovina; neutral; clear irregular boundary.

C1—39 to 48 inches; grayish brown (2.5Y 5/2) light silty clay loam; common fine distinct yellowish red (5YR 4/6) and grayish brown (10YR 5/2) mottles; massive; friable; neutral; abrupt smooth boundary.

IIC2—48 to 60 inches; grayish brown (2.5 Y 5/2) sandy loam; massive; friable; neutral.

The solum ranges from 36 to 50 inches in thickness. Free carbonates are at a depth of 48 inches or more. The mollic epipedon is 12 to 24 inches thick.

The A horizon typically is black (10YR 2/1 or N 2/0) but it can range to very dark gray (10YR 3/1). It is silty clay loam but can be silt loam, loam, and clay loam. The A horizon has common or many iron and manganese oxides, oxide stains, or mottles of dark red (2.5YR 3/6), dark reddish brown, (5YR 3/3 and 3/4) or reddish brown (5YR 4/3 to 5/4).

B1g horizon has hue of 10YR or 2.5Y, value of 3 or 4, and chroma of 1 or 2. Oxides and mottles are similar to those of the A horizon. The B2 horizon has hue of 2.5Y or 5Y, value of 4 to 6, and chroma of 1 or 2. The lower horizons, part of the B2g horizon and the B3g horizon, have hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 4 to 6, which are in the range for the series. The B2 horizon commonly is silty clay loam, but the thin horizons of clay loam are in the range for the series. Clay content of the B2 horizon ranges from 28 to 35 percent. Reaction in the B horizon ranges from neutral to medium acid.

The C horizon has hue of 2.5Y or 5Y, value of 4 to 6, and chroma of 1 or 2. The C horizon commonly is silty clay loam or silt loam but ranges to loam and clay loam. Typically, there are strata of sandy loam or loamy sand.

Ely series

The Ely series consists of somewhat poorly drained, moderately permeable soils on foot slopes and on alluvial fans where drainageways empty into the bottom lands. These soils formed in silty, alluvial sediments washed from loess-covered, adjacent hillsides. Slope ranges 2 to 5 percent.

The Ely soils are commonly adjacent to Colo soils. Colo soils are poorly drained and have a grayer B horizon than the Ely soils.

Typical pedon of Ely silt loam, 2 to 5 percent slopes, in a cultivated field on a southeast-facing alluvial fan; 69 feet south and 1,450 feet east of the northwest corner of sec 34, T. 83 N., R. 1 E.

Ap—0 to 9 inches; very dark brown (10YR 2/2) heavy silt loam; weak fine granular structure; friable; medium acid; clear smooth boundary.

A12—9 to 20 inches; black (10YR 2/1) light silty clay loam; moderate fine granular structure; friable; medium acid; gradual smooth boundary.

A13—20 to 26 inches; very dark gray (10YR 3/1) light silty clay loam; moderate fine and very fine subangular blocky structure; friable; medium acid; gradual smooth boundary.

B1—26 to 34 inches; very dark grayish brown (10YR 3/2) medium silty clay loam; weak fine and medium subangular blocky structure; friable; slightly acid; gradual smooth boundary.

B21—34 to 41 inches; olive brown (2.5Y 4/4) medium silty clay loam; few fine distinct yellowish brown (10YR 5/6) and few fine faint grayish brown (2.5Y 5/2) mottles; weak medium subangular blocky structure; friable; slightly acid; gradual smooth boundary.

B22—41 to 49 inches; mottled grayish brown (10YR 5/2) and light olive brown (2.5Y 5/4) light silty clay loam; common fine distinct strong brown (7.5YR 5/6) mottles; weak fine and very fine subangular blocky structure; friable; neutral; gradual smooth boundary.

B3—49 to 60 inches; very dark grayish brown (10YR 3/2) light silty clay loam; common fine distinct strong brown (7.5YR 5/6) mottles; weak medium prismatic structure; friable; few dark concretions; neutral.

The solum is usually more than 48 inches thick but ranges from 40 to 70 inches or more in thickness. The A horizon is black (10YR 2/1), very dark brown (10YR 2/2), very dark gray (10YR 3/1), or very dark grayish brown (10YR 3/2). Color value of 3 extends to a depth of 24 to 36 inches. The A horizon is silt loam or light silty clay loam. The B horizon is typically very dark grayish brown (10YR 3/2), dark grayish brown (10YR 4/2), grayish brown (10YR 5/2), or olive brown (2.5Y 4/4). Mottles that have chroma of 2 are in the lower part. The B horizon is silty clay loam that is about 28 to 32 percent clay. Reaction in the B horizon ranges from neutral to medium acid, but in places it can be neutral throughout.

Fayette series

The Fayette series consists of well drained, moderately permeable soils on loess-covered uplands. These soils formed in loess that is more than 40 inches thick. Slope ranges from 2 to 40 percent.

Fayette soils are similar to Downs soils and are commonly adjacent to Downs and Nordness soils. Downs soils have a thicker A1 horizon than the Fayette soils and a less distinct A2 horizon. Nordness soils have limestone bedrock at a depth of less than 15 inches.

Typical pedon of Fayette silt loam, 5 to 9 percent slopes, in a pasture on a north- to northeast-facing, narrow, convex interfluve, in uplands; 800 feet south and 2,520 feet west of the northeast corner sec. 30, T. 81 N., R 1 E.

A1—0 to 4 inches; very dark grayish brown (10YR 3/2) silt loam; weak fine granular structure; friable slightly acid; clear wavy boundary.

A2—4 to 8 inches; dark grayish brown (10YR 4/2) silt loam; very weak thin platy structure; friable; medium acid; clear wavy boundary.

B1t—8 to 13 inches; yellowish brown (10YR 5/4) heavy silt loam; weak and moderate fine angular and subangular structure; friable; very thin patchy clay films; medium acid; gradual smooth boundary.

B21—13 to 19 inches; yellowish brown (10YR 5/4) silty clay loam; moderate fine and very fine angular blocky structure; friable; very thin patchy light gray (10YR 7/2) dry silt coatings on peds; medium acid; gradual smooth boundary.

B22t—19 to 26 inches; yellowish brown (10YR 5/4) silty clay loam; strong fine and medium angular blocky structure; slightly firm; thin patchy clay films, thin patchy light gray (10YR 7/2) dry silt coatings on peds; medium acid; gradual smooth boundary.

B23t—26 to 34 inches; yellowish brown (10YR 5/4) silty clay loam; moderate and strong medium angular structure and some subangular blocky structure; slightly firm; thin patchy clay films; thin discontinuous light gray (10YR 7/2) dry silt coatings; medium acid; gradual smooth boundary.

B31t—34 to 42 inches; yellowish brown (10YR 5/6) silty clay loam; strong medium and fine subangular and angular blocky structure; firm; thin and medium nearly continuous clay films; a few thin patchy light gray (10YR 7/2) dry silt coatings; strongly acid; gradual smooth boundary.

B32t—42 to 56 inches; yellowish brown (10YR 5/4) light silty clay loam; moderate coarse prismatic structure parting to moderate medium angular and subangular blocky; friable; thin to thick nearly continuous light gray (10YR 7/2) dry silt coatings on peds; thin patchy clay films; strongly acid; gradual smooth boundary.

C—56 to 60 inches; yellowish brown (10YR 5/4) silt loam; few fine faint light brownish gray (10YR 6/2) mottles; weak coarse prismatic structure; friable; few fine dark brown oxide concretions; medium acid.

The solum ranges from 40 to 60 inches in thickness. There are no carbonates to a depth of 40 inches to 60 inches.

The A1 horizon ranges from very dark gray (10YR 3/1) to very dark grayish brown (10YR 3/2) or dark grayish brown (10YR 4/2). When cultivated or eroded, the Ap horizon is dark grayish brown (10YR 4/2) or brown (10YR 4/3). The A2 horizon is 3 to 5 inches thick. It can be incorporated into the Ap horizon in cultivated areas. The B2 horizon is silty clay loam that has clay content of from 30 to 35 percent. The B horizon is free of mottles that have low chroma to a depth of 30 inches or more. Reaction in the B horizon is medium acid or very strongly acid.

Finchford series.

The Finchford series consists of excessively drained, very rapidly permeable soils on benches along streams. These soils formed in sands that have been deposited predominantly by water. Slope ranges from 0 to 9 percent.

Finchford soils are similar to Sparta soils and are commonly adjacent to Ambraw, Dickinson, Raddle, and Shaffton soils. The Flagler soils have gravel at a depth of about 30 inches. Sparta soils have less coarse sand. The Ambraw and Shaffton soils formed in loamy alluvium over sand material, which is at a depth of 2 to 3 feet. They are more poorly drained and have a grayer B horizon than the Finchford soils. The Dickinson soils have a finer texture. The Raddle soils formed in silty alluvium.

Typical pedon of Finchford loamy sand, 0 to 2 percent slopes, in a cultivated field on a nearly level terrace along streams; 3,400 feet south and 1,660 feet west of the northeast corner of sec. 28, T. 81 N., R. 6 E.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) loamy sand; very weak medium subangular blocky structure; very friable; 2 to 5 percent gravel; medium acid; gradual smooth boundary.

A12—7 to 18 inches; very dark grayish brown (10YR 3/2) loamy sand; very weak medium subangular blocky structure; very friable; 2 to 5 percent gravel; medium acid; gradual smooth boundary.

B2—18 to 31 inches; dark brown (7.5YR 3/2) light loamy sand; very weak medium subangular blocky structure; very friable; 10 percent coarse sand; 2 to 5 percent gravel; medium acid; gradual smooth boundary.

C1—31 to 40 inches; brown (7.5YR 5/3) coarse sand; single grained; loose; 5 to 10 percent gravel; medium acid; gradual smooth boundary.

C2—40 to 49 inches; brown (7.5YR 5/3) coarse sand; single grained; loose; 10 to 15 percent gravel; slightly acid; clear smooth boundary.

C3—49 to 60 inches; brown (7.5YR 5/3) coarse sand; single grained; loose; 10 to 15 percent gravel; slightly acid.

The solum ranges from 24 to 40 inches in thickness. The A horizon is 15 to 30 inches thick. It has hue of 10YR, value of 2 or 3, and chroma of 2. The A horizon is loamy sand or sand. The B horizon has hue of 10YR or 7.5YR; value of 3, 4, or 5; and chroma of 2, 3, or 4. It is loamy sand or sand. Reaction in the B horizon is medium or strongly acid. The C horizon has hue of 10YR or 7.5YR; value of 3, 4, or 5; and chroma of 3 to 5. The amount of coarse sand and gravel increases with depth.

Flagler series

The Flagler series consists of somewhat excessively drained soils on benches along streams and on outwash plains of uplands. These soils are moderately rapidly permeable in the solum and very rapidly permeable in the substratum. They formed in about 24 to 36 inches of sandy loam and in the underlying loamy sand and sand and gravel. Slope ranges from 1 to 9 percent.

Flagler soils are similar to Burkhardt soils and are commonly adjacent to Dickinson and Waukee soils. The Burkhardt soils are shallower to coarse sand and gravel than the Flagler soils. Dickinson soils, unlike the Flagler soils, have no gravel within a depth of 60 inches or more. The Waukee soils have a higher content of clay in the A horizon and in the upper part of the B horizon than the Flagler soils.

Typical pedon of Flagler sandy loam, 1 to 5 percent slopes, in a cultivated field on a level terrace along streams; 2,240 feet north and 2,200 feet west of the southeast corner of sec. 10, T. 80 N., R. 5 E.

Ap—0 to 7 inches; very dark brown (10YR 2/2) sandy loam; weak medium subangular blocky structure; friable; medium acid; abrupt smooth boundary.

A12—7 to 14 inches; very dark brown (10YR 2/2) sandy loam; weak fine and medium subangular blocky structure; friable; slightly acid; gradual smooth boundary.

A3—14 to 19 inches; very dark grayish brown (10YR 3/2) sandy loam; weak fine subangular blocky structure; friable; medium acid; clear wavy boundary.

B21—19 to 26 inches; brown (10YR 4/3) sandy loam; weak medium subangular blocky structure; friable; medium acid; clear wavy boundary.

B22—26 to 35 inches; dark yellowish brown (10YR 4/4) sandy loam; weak medium subangular blocky structure; very friable; 5 percent gravel; clay bridging on sand grains; medium acid; clear irregular boundary.

IIC—35 to 60 inches; dark yellowish brown (10YR 4/4) sand; single grained; loose; 7 percent gravel; at a

depth of 40 to 42 inches, thin strata of gravelly sand; medium acid.

The solum ranges from 24 to 40 inches in thickness. The A horizon is 12 to 20 inches thick. The B2 horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. The B2 horizon is typically sandy loam but is fine sand in the lower part. Reaction in the B horizon is slightly acid to medium acid. The IIC horizon has hue of 10YR, value of 4 or 5, and chroma of 4 to 6. The IIC horizon is typically sand but includes gravelly sand. The percentage of gravel, by volume, is about 5 to 15 percent.

Gara series

The Gara series consists of moderately well drained, moderately slowly permeable soils on convex side slopes. These soils are in uplands. They formed in glacial till. Slope ranges from 9 to 14 percent.

The Gara soils are similar to Lindley soils and are commonly adjacent to Colo and Downs soils. The Colo soils formed in silty alluvium. They are in drainageways downslope from the Gara soils. They are poorly drained and have a grayer B horizon. The Downs soils, formed in loess, are usually upslope from the Gara soils. The Lindley soils have a lighter colored A horizon than the Gara soils but formed in similar material.

Typical pedon of Gara loam, 9 to 14 percent slopes, moderately eroded, in a hayfield on a convex side slope, in uplands; 1,250 feet west and 120 feet south of the northeast corner of sec 8, T. 81 N., R. 1 E.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) loam mixed with dark yellowish brown (10YR 4/4); weak fine and medium subangular blocky structure; friable; neutral abrupt smooth boundary.

B1—7 to 12 inches; dark yellowish brown (10YR 4/4) light clay loam; weak fine and medium subangular blocky structure; friable; neutral; gradual smooth boundary.

B21t—12 to 22 inches; brown (10YR 5/3) light clay loam that has brown (10YR 4/3) coatings on peds; moderate medium subangular blocky structure; firm; thin discontinuous clay films; slightly acid; clear smooth boundary.

B22t—22 to 35 inches; yellowish brown (10YR 5/4) clay loam that has brown (10YR 4/3) coatings on peds; few fine distinct grayish brown (10YR 5/2) mottles; moderate medium prismatic structure; firm; at a depth of 22 to 25 inches, thin discontinuous light gray (10YR 7/2) dry silt and sand coatings on peds; thin discontinuous clay films; medium acid; gradual smooth boundary.

B3—35 to 44 inches; yellowish brown (10YR 5/6) clay loam that has brown (10YR 4/3) coatings on peds; few fine distinct grayish brown (10YR 5/2) mottles; moderate coarse prismatic structure; firm; few fine very dark brown (10YR 2/2) oxide concretions; neutral; clear wavy boundary.

C—44 to 60 inches; yellowish brown (10YR 5/6) clay loam that has brown (10YR 4/3) coatings on peds; few fine distinct grayish brown (10YR 5/2) mottles; massive; vertical cleavage; firm; moderately alkaline.

The solum ranges from 40 to 50 inches in thickness. Depth to carbonates ranges from 40 to 70 inches.

In undisturbed areas the Ap or A1 horizon is 6 to 8 inches thick. It has hue of 10YR, value of 3, and chroma of 1 or 2. The A2 horizon has hue of 10YR, value of 4 or 3, and chroma of 2. The A horizon is loam or silt loam. The B2 horizon has hue of 10YR or 7.5YR; value of 4 or 5; and chroma of 2, 3, or 4. It is loam or clay loam. Reaction in the B horizon is neutral to medium acid.

Garwin series

The Garwin series consists of poorly drained, moderately permeable soils on loess-covered, depressional heads of drainageways in uplands and on loess-covered benches along streams. Slope ranges from 0 to 2 percent.

The Garwin soils are similar to Muscatine soils and are commonly adjacent to Muscatine and Tama soils. Muscatine soils are better drained and have browner colors than the Garwin soils. They are upslope from the Garwin soils. Tama soils have a browner B horizon and are well drained. Typically, they are on convex ridges and side slopes.

Typical pedon of Garwin silty clay loam, 0 to 2 percent slopes, in a cultivated field on a northeast-facing, concave slope, in uplands; 1,110 feet east and 1,240 feet north of the southwest corner of sec. 12, T. 81 N., R. 5 E.

Ap—0 to 7 inches; black (N 2/0) silty clay loam; weak fine subangular blocky structure; friable; neutral; clear smooth boundary.

A12—7 to 13 inches; black (N 2/0) silty clay loam; moderate medium and fine subangular blocky structure; friable; neutral; clear smooth boundary.

A13—13 to 18 inches; black (10YR 2/1) silty clay loam; moderate fine and medium subangular blocky structure; friable; neutral; gradual smooth boundary.

B1g—18 to 25 inches; dark gray (10YR 4/1) silty clay loam that has few very dark gray (10YR 3/1) coatings on peds; weak medium and fine subangular blocky structure; friable; neutral; gradual smooth boundary.

B21g—25 to 33 inches; olive gray (5Y 5/2) silty clay loam; few fine distinct yellowish brown (10YR 5/6) mottles; moderate medium and fine subangular blocky structure; friable; slightly acid; gradual smooth boundary.

B22g—33 to 38 inches; olive gray (5Y 5/2) silty clay loam; few fine distinct yellowish brown (10YR 5/6)

and few fine prominent brown (7.5YR 5/4) mottles; moderate medium subangular blocky structure; friable; slightly acid; gradual smooth boundary.

B3g—38 to 50 inches; olive gray (5Y 5/2) light silty clay loam; few fine distinct yellowish brown (10YR 5/6) and few fine prominent brown (7.5YR 5/4) mottles; weak medium prismatic structure parting to weak fine subangular blocky; friable; dark krotovina at a depth of 43 to 49 inches; slightly acid; gradual smooth boundary.

C—50 to 60 inches; olive gray (5Y 5/2) silt loam that has dark gray (10YR 4/1) coatings on root channels; many fine distinct yellowish brown (10YR 5/6) mottles; massive; friable; dark krotovina at a depth of 58 inches; slightly acid.

The solum ranges from 40 to 55 inches in thickness. Carbonates range in depth from 48 to 70 inches or more.

The A1 or Ap horizon is from black (N 2/) to very dark gray (10YR 3/1). The A horizon is 14 to 23 inches thick. It is silty clay loam or silt loam. The B2 horizon has hue of 5Y and 2.5Y, value of 3 to 5, and chroma of 1 to 2. The B1 or B2 horizon is silty clay loam and ranges in content of clay from 28 to 34 percent.

Granby series

The Granby series consists of poorly drained, rapidly permeable soils on alluvial fans, in drainageways, and in depressions in benches along streams. The soils formed in sand that has been deposited by wind or water or both. Slope ranges from 0 to 2 percent.

Granby soils are commonly adjacent in the landscape to Brady, Dickinson, Marshan, and Sparta soils. Brady soils, unlike the Granby soils, have an A2 horizon and are somewhat poorly drained. Dickinson soils are somewhat excessively drained. Marshan soils have a loamy texture, and sand and gravel are at a depth of 3 feet. Sparta soils are excessively drained. The Dickinson and Sparta soils have a browner B horizon than the Granby soils, and the Brady soils have browner B and C horizons.

Typical pedon of Granby fine sandy loam, 0 to 2 percent slopes, in a cultivated field on a southeast-facing concave slope; 1,020 feet south and 200 feet east of the northwest corner of sec. 6, T. 82 N., R. 1 E.

Ap—0 to 10 inches; black (10YR 2/1) fine sandy loam; weak medium granular structure; very friable; neutral; abrupt wavy boundary.

B2g—10 to 26 inches; gray (5Y 5/1) fine sand; weak coarse subangular blocky structure; very friable; at a depth or 24 inches, 2-inch dark gray (5Y 4/1) sandy loam band that has few fine faint light olive brown (2.5Y 5/4) mottles; neutral; abrupt smooth boundary.

C2g—26 to 35 inches; dark gray (5Y 4/1) fine sand; single grained; loose; neutral; clear smooth boundary.

C3g—35 to 40 inches; dark gray (5Y 4/1) loamy fine sand; few fine distinct light olive brown (2.5Y 5/4) mottles; single grained; loose; neutral; clear smooth boundary.

C4g—40 to 60 inches; gray (5Y 5/1) fine sand; single grained; loose neutral.

The solum ranges fom 24 to 36 inches in thickness. The A1 horizon is from 8 to 12 inches thick. It is black (10YR 2/1 or N 2/0) or very dark gray (10YR 3/1). The A horizon is fine sandy loam, sandy loam, or loamy fine sand. The B horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 or 2. The C horizon is hue of 10YR, 2.5Y, or 5Y; value of 4, 5, or 6; and chroma of 1 or 2. It is fine sand or loamy fine sand. Fine sand is dominant throughout the control section.

Kenyon series

The Kenyon series consists of moderately well drained, moderately permeable soils on convex ridges and side slopes in uplands. These soils formed in 14 to 24 inches of loamy material and in the underlying glacial till. Slope ranges from 2 to 9 percent.

The 83C2 map unit is a taxadjunct to the Kenyon series because it does not have a mollic epipedon. This difference does not alter the usefulness or behavior of the soil.

Kenyon soils are similar to Aredale soils, which also formed in loamy material and in the underlying glacial till. Kenyon soils are commonly adjacent to Aredale, Dinsdale, Klinger, and Readlyn soils. The Aredale soils are underlain by glacial till at a depth of 4 feet. The Dinsdale and Klinger soils formed in silty material over glacial till. The Klinger and Readlyn soils have a grayer B horizon than the Kenyon soils and are somewhat poorly drained.

Typical pedon of Kenyon loam, 2 to 5 percent slopes, in a cultivated field on a northeast-facing, convex slope; 550 feet south and 1,336 feet east of the northwest corner of sec. 13, T. 82 N., R. 1 E.

Ap—0 to 6 inches; black (10YR 2/1) loam; weak fine granular structure; friable; neutral; abrupt smooth boundary.

A12—6 to 11 inches; black (10YR 2/1) loam; weak fine granular structure; friable; medium acid; clear smooth boundary.

A3—11 to 16 inches; very dark grayish brown (10YR 3/2) heavy loam; weak fine and medium granular structure; friable; medium acid; clear smooth boundary.

B21—16 to 22 inches; brown (10YR 5/3) heavy loam that has brown (10YR 4/3) coatings on faces of peds; moderate fine subangular blocky structure; friable; at a depth of 22 inches, diffuse pebble band, strongly acid; abrupt irregular boundary.

IIB22t—22 to 33 inches; yellowish brown (10YR 5/6) heavy loam; few fine faint grayish brown (10YR 5/2)

and strong brown (7.5YR 5/6) mottles; moderate fine and medium subangular blocky structure; firm; thin discontinuous clay films; discontinuous grayish brown (10YR 5/2) coatings on faces of peds; medium acid; gradual smooth boundary.

IIB3t—33 to 44 inches; yellowish brown (10YR 5/6) heavy loam that has brown (10YR 4/3) coatings on faces of peds; few faint grayish brown (10YR 5/2) mottles; strong medium prismatic structure parting to moderate and strong coarse and medium subangular blocky; firm; few discontinuous dark gray (10YR 4/1) clay films on face of vertical cleavage; few fine black (10YR 2/1) oxide accumulations; medium acid; gradual smooth boundary.

IIC—44 to 60 inches; yellowish brown (10YR 5/6) loam; few fine distinct grayish brown (10YR 5/2) mottles; massive; vertical cleavage; firm; neutral; gradual smooth boundary.

The solum ranges from 44 to 60 inches in thickness. Carbonates range in depth from 45 to 65 inches. The loamy glacial till is at a depth of 14 to 24 inches.

The A1 horizon is black (10YR 2/1) or very dark brown (10YR 2/2). It ranges from about 10 to 20 inches in thickness, unless it has been eroded. It usually decreases in thickness as slope increases. The A horizon is typically loam but can be silt loam that is high in content of sand. The B2 horizon is brown (10YR 4/3) to yellowish brown (10YR 5/6). It is 4 to 8 inches thick. Reaction in the B horizon ranges from medium acid to strongly acid. The IIB horizon is brown (10YR 4/3) to yellowish brown (10YR 5/8) and has few mottles that have hue of 10YR or 7.5YR. It is typically loam but ranges to clay loam and sandy clay loam. It is 20 to 30 inches thick. The IIC horizon is similar in color and texture to the IIB horizon, except that grayish mottles become more distinct in the IIC horizon.

Klinger series

The Klinger series consists of somewhat poorly drained, moderately permeable soils on broad ridges and gentle side slopes. The soils are in uplands. They formed in 24 to 40 inches of loess and in the underlying glacial till. Slope ranges from 1 to 3 percent.

The Klinger soils are commonly adjacent to Dinsdale and Maxfield soils. The Dinsdale soils are well drained and have a browner B horizon than the Klinger soils. The Maxfield soils are poorly drained and have a grayer B horizon. They are downslope from the Klinger soils.

Typical pedon of Klinger silt loam, 1 to 3 percent slopes, in a cultivated field on a south-facing side slope, in uplands; 900 feet north and 84 feet west of the southeast corner of sec. 1, T. 82 N., R. 1 E.

Ap—0 to 8 inches; black (10YR 2/1) silt loam; weak fine granular structure; friable; neutral; abrupt smooth boundary.

A12—8 to 17 inches; very dark brown (10YR 2/2) light silty clay loam; weak fine granular structure; friable; medium acid; clear smooth boundary.

B1—17 to 24 inches; dark grayish brown (2.5Y 4/2) light silty clay loam; very dark grayish brown (10YR 3/2) kneaded; weak fine and medium subangular blocky structure; friable; common very dark grayish brown (10YR 3/2) coatings on faces of peds; medium acid; clear wavy boundary.

B21t—24 to 31 inches; dark grayish brown (2.5Y 4/2) and yellowish brown (10YR 5/4) silty clay loam; dark grayish brown (10YR 4/2) kneaded; weak fine subangular blocky structure; friable; few very dark grayish brown (10YR 3/2) coatings on faces of peds; few thin discontinuous clay films; medium acid; clear wavy boundary.

IIB22t—31 to 36 inches; light olive brown (2.5Y 5/4) and dark grayish brown (10YR 4/2) loam; weak fine subangular blocky structure; friable; few very dark grayish brown (10YR 3/2) coatings on faces of peds; few fine discontinuous clay films; slightly acid; abrupt smooth boundary.

IIB3—36 to 41 inches; yellowish brown (10YR 5/6) heavy loam; few fine faint grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; firm; slightly acid; gradual smooth boundary.

IIC—41 to 60 inches; yellowish brown (10YR 5/6) heavy loam; few medium distinct light brownish gray (2.5Y 6/2) mottles; massive; firm; neutral.

The solum ranges from about 40 to 60 inches in thickness. The loess is typically 24 to 40 inches thick. The A horizon is typically black (10YR 2/1) or very dark brown (10YR 2/2). It has value of 3 and chroma of 1 or 2 in the lower part. The A horizon is silt loam or silty clay loam. It is 16 to 22 inches thick. The B horizon, which formed from the loess, is dominantly dark grayish brown (2.5Y 4/2), but it includes value of 5 and chroma of 3 or 4 in a minor part of the matrix. The B2t horizon, in the loess, is silty clay loam. It ranges in clay content from 30 to 34 percent. Reaction in the B horizon ranges from slightly acid to strongly acid. The IIB horizon has value of 4 and 5 and chroma of 2 to 6. Its mottles are of higher chroma. The IIB horizon is loam, clay loam, or sandy clay loam.

Koszta series

The Koszta series consists of somewhat poorly drained, moderately permeable soils on benches along major streams. These soils formed in silty alluvium. Slope ranges from 0 to 2 percent.

These soils have a higher B/A clay ratio and are shallower in depth to the maximum clay content than is defined as the range for the Koszta series, but these differences do not alter the usefulness and behavior of these soils.

The Koszta soils are commonly adjacent to Colo, Nevin, and Raddle soils. The Colo soils have a thicker A

horizon and a grayer B horizon than the Koszta soils. They are poorly drained. The Nevin and Raddle soils have a thicker A1 horizon than the Koszta soils but do not have an A2 hoirzon. The Raddle soils are well drained and have a browner B horizon than the Koszta soils.

Typical pedon of Koszta silt loam, 0 to 2 percent slopes, in a cultivated field on a level, low terrace along streams; 320 feet east and 1,780 feet south of the northwest corner of sec. 15, T 81 N., R. 1 E.

Ap—0 to 7 inches; black (10YR 2/1) silt loam; weak fine granular structure; friable; neutral; abrupt smooth boundary.

A2—7 to 9 inches; dark grayish brown (10YR 4/2) silt loam; weak and moderate thin platy structure; friable; few discontinuous very dark grayish brown (10YR 3/2) coatings on faces of peds; few fine yellowish brown (10YR 5/6) concretions; neutral; clear smooth boundary.

B1—9 to 14 inches; dark grayish brown (10YR 4/2) heavy silt loam; few fine distinct yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; friable; medium acid; clear smooth boundary.

B21t—14 to 25 inches; dark grayish brown (10YR 4/2) silty clay loam; common fine faint yellowish brown (10YR 5/6) and few fine faint grayish brown (2.5Y 5/2) mottles; moderate fine and medium angular and subangular blocky structure; friable; thin discontinuous clay films and coatings on faces of peds; medium acid; gradual smooth boundary.

B22t—25 to 34 inches; dark grayish brown (2.5Y 4/2) silty clay loam; common fine distinct yellowish brown (10YR 5/6) mottles; moderate medium angular and subangular blocky structure; firm; thin discontinuous clay films; thin patchy coatings on faces of peds; medium acid; gradual smooth boundary.

B3t—34 to 45 inches; dark grayish brown (2.5Y 4/2) light silty clay loam; common fine and medium distinct yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to weak fine and medium subangular blocky; friable; thin discontinuous clay films on faces of peds; medium acid; gradual smooth boundary.

C—45 to 60 inches; dark grayish brown (2.5Y 4/2) silt loam; common fine and medium distinct yellowish brown (10YR 5/6) mottles; massive; vertical cleavage; friable; medium acid.

The A1 or Ap horizons are black (10YR 2/1), very dark brown (10YR 2/2) or very dark gray (10YR 3/1). The A2 horizon is hue of 10YR, value of 4 or 5, and chroma of 2. The B horizon has hue of 2.5Y, 10YR, or 5Y; value of 4 or 5; and chroma of 1, 2, or 3. The B horizon is silty clay loam but includes silt loam in the upper part. Parts of the B horizon commonly contain clay films and coatings on faces of peds. Mottles in the B horizon are hue of 10YR, 7.5YR, and 2.5Y; value of 4 or 5; and chroma of 2 through 6. Reaction in the B horizon ranges from medium to strongly acid. The C horizon has colors and mottles that are similar to those of the B horizon. It is silt loam. Some profiles have thin strata of loamy sand.

Lamont series

The Lamont series consists of somewhat excessively drained soils in uplands and on benches along streams. These soils formed in sands that have been deposited predominantly by wind. Permeability is moderately rapid in the subsoil and rapid in the substratum. Slope ranges from 3 to 8 percent.

Lamont soils are similar to Dickinson soils and are commonly adjacent to Brady, Chelsea, and Granby soils. The Brady soils are somewhat poorly drained. The Chelsea soils have less clay in the A and B horizon than the Lamont soils. The Dickinson soils have textures similar to those of the Lamont soils. They have a thicker A1 horizon, but, unlike the Lamont soils, do not have an A2 horizon. The Granby soils are poorly drained. Both the Brady and Granby soils have a grayer B horizon than the Lamont soils.

Typical pedon of Lamont fine sandy loam, 3 to 8 percent slopes, in a woodland area that has been recently cleared, on a southwest-facing side slope, in uplands; 500 feet south and 1,167 feet west of northest corner of sec. 25, T. 81 N., R. 1 E.

A1—0 to 5 inches; very dark grayish brown (10YR 3/2) fine sandy loam; light brownish gray (10YR 6/2) dry; weak fine granular structure; very friable; neutral; abrupt wavy boundary.

A2—5 to 9 inches; dark grayish brown (10YR 4/2) fine sandy loam that has common fine very dark grayish brown (10YR 3/2) coatings of faces of peds; weak medium platy structure; very friable; strongly acid; clear wavy boundary.

B1—9 to 13 inches; brown (10YR 5/3) fine sandy loam; weak coarse and medium subangular structure; very friable; medium acid; clear wavy boundary.

B21t—13 to 23 inches; brown (10YR 4/3) heavy sandy loam; weak medium angular blocky structure parting to weak fine subangular blocky; very friable; few fine nearly continuous clay films; few fine dark oxides; medium acid; gradual smooth boundary.

B22t—23 to 30 inches; dark yellowish brown (10YR 4/4) heavy sandy loam; weak coarse subangular structure parting to weak medium subangular blocky; very friable; few thin patchy clay films; medium acid; gradual smooth bounary.

C—30 to 43 inches; yellowish brown (10YR 5/4) loamy sand; massive; very friable; few fine distinct strong brown (7.5YR 5/8) iron stains; at a depth of 43 to 58 inches, 1/2 to 1 inch brown (7.5YR 4/4) light sandy loam bands, medium acid.

A&B—43 to 60 inches; yellowish brown (10YR 5/4) loamy sand; massive; very friable; few fine distinct strong brown (7.5YR 5/8) iron stains; at a depth of 43 to 58 inches, 1/2 to 1 inch brown (7.5YR 4/4) light sandy loam bands; medium acid.

The solum ranges from 24 to 40 inches in thickness. The A1 horizon is 2 to 6 inches thick. It is hue of 10YR, value of 3 or 4, and chroma of 1 or 2. In uneroded areas the A2 horizon is 3 to 6 inches thick. It is hue of 10YR, value of 4 or 5, and chroma of 2 or 3. In some places the A2 horizon is incorporated in the Ap horizon. The B2 horizon has hue of 10YR or 7.5YR; value of 4 to 5; and chroma of 3, 4, 5, or 6. Reaction in the B horizon is medium or strongly acid. The C horizon has hue of 10YR; value of 5; and chroma of 4, 5, or 6. In most pedons the A&B horizon has few lamellae of sandy loam which are 1/2 to 1 inch thick and have hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 3 or 4. The C horizon is loamy sand or sand.

Lawler series

The Lawler series consists of somewhat poorly drained soils on benches along streams in outwash areas in uplands. These soils formed in 32 to 40 inches of loamy material and in the underlying coarse textured material. They are moderately permeable in the loamy material and very rapidly permeable in the underlying, coarse textured material. Slope ranges from 0 to 2 percent.

The Lawler soils are similar to Udolpho soils and are commonly adjacent to Udolpho, Marshan, Saude, and Waukee soils. Unlike the Lawler soils, the Udolpho soils have an A2 horizon. They have a thinner A1 horizon than the Lawler soils. The Marshan soils have a grayer B horizon and are poorly drained. The Saude soils have sand and gravel at a depth of 24 to 32 inches. The Saude and Waukee soils have a browner B horizon than the Lawler soils and are well drained.

Typical pedon of Lawler loam, 32 to 40 inches to sand and gravel, 0 to 2 percent slopes, in a cultivated field on an east- to north-facing, convex terrace along a stream; 640 feet east and 1,720 feet south of the northwest corner of sec 1, T. 80 N., R. 2 E.

Ap—0 to 8 inches; black (10YR 2/1) loam; weak fine granular structure; friable; neutral; clear smooth boundary.

A12—8 to 12 inches; very dark grayish brown (10YR 3/2) loam that has black (10YR 2/1) coatings on faces of peds; weak fine granular structure; friable; neutral; clear smooth boundary.

A3—12 to 17 inches; very dark grayish brown (10YR 3/2) loam that has dark grayish brown (10YR 4/2) coatings on faces of peds; weak fine subangular blocky structure parting to weak fine granular; friable; neutral; clear smooth boundary.

B21—17 to 24 inches; dark grayish brown (10YR 4/2) heavy loam; few fine faint yellowish brown (10YR 5/4) and few fine distinct strong brown (7.5YR 5/6) mottles; weak fine and medium subangular blocky structure; friable; slightly acid; gradual smooth boundary.

B22—24 to 31 inches; grayish brown (2.5Y 5/2) heavy loam; few fine distinct strong brown (7.5YR 5/6) mottles; weak and moderate fine and medium subangular blocky structure; friable; medium acid; gradual smooth boundary.

B31—31 to 35 inches; grayish brown (2.5Y 5/2) loam; few fine distinct strong brown (7.5YR 5/6) mottles; weak medium and coarse subangular blocky structure; friable; strongly acid; clear smooth boundary.

IIB32—35 to 41 inches; grayish brown (2.5Y 5/2) loamy sand; few fine distinct yellowish brown (10YR 5/6) mottles; weak medium subangular structure; friable; few fine gravel pebbles; medium acid; clear smooth boundary.

IIC—41 to 60 inches; light brownish gray (2.5Y 6/2) and light gray (10YR 7/2) fine and medium sand; few fine distinct yellowish brown (10YR 5/6) mottles; single grained; very friable; at a depth of 50 to 55 inches, 1/4 to 1/2 inch yellowish brown (10YR 5/6) iron bands; medium acid.

The thickness of the solum and depth to coarse textures ranges from 32 to 40 inches but is as shallow as 24 inches. The A1 horizon is black (10YR 2/1), very dark gray (10YR 3/1), or very dark grayish brown (10YR 3/2). The A3 horizon is very dark gray (10YR 3/1) or very dark grayish brown (10YR 3/2). The A horizon typically ranges from 12 to 18 inches. It is loam or silt loam, which has a high content of sand. The B2 horizon has hue of 2.5Y or 10YR, value of 4 or 5, and chroma of 2. It has chroma of 3 or 4 if mottles have a higher chroma. In some areas value of 3 extends to a depth of 24 inches. The B2 horizon is loam but ranges to sandy clay loam. The IIB3 horizon or the upper part of the C horizon typically ranges from loamy sand to gravelly sand.

Lindley series

The Lindley series consists of well drained, moderately slowly permeable soils on convex side slopes. These soils are in uplands. They formed in glacial till. Slope ranges from 14 to 40 percent.

Lindley soils are similar to Gara soils and are commonly adjacent to Chaseburg and Fayette soils. The Chaseburg soils formed in silty alluvium and are downslope from the Lindley soils. They are in drainageways. The Fayette soils, formed in loess, are usually upslope from the Lindley soils. The Gara soils formed in material similar to that of Lindley soils, but they have a darker colored A horizon.

Typical pedon of Lindley loam, 14 to 18 percent slopes, moderately eroded, in a hayfield on a northwest-facing side slope, in uplands; 420 feet north and 1,230 feet west of the southeast corner of sec. 16. T. 83 N., R 1 E.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) loam intermixed with brown (7.5YR 4/4); moderate fine granular structure; friable; neutral; abrupt smooth boundary.

B21t—6 to 10 inches; brown (7.5YR 4/4) clay loam; moderate fine and very fine angular blocky structure; firm; thin discontinuous clay films; thin discontinuous light gray (10YR 7/2) dry coatings on faces of peds; slightly acid; clear smooth boundary.

B22t—10 to 15 inches; yellowish brown (10YR 5/4) clay loam; strong fine and medium angular blocky structure; firm; very thin discontinuous clay films; thick nearly continuous light gray (10YR 7/2) dry coatings on faces of peds; medium acid; clear smooth boundary.

B23t—15 to 21 inches; yellowish brown (10YR 5/6) clay loam; moderate medium prismatic structure parting to moderate medium angular blocky; firm; thin continuous clay films; medium acid; clear smooth boundary.

B24t—21 to 31 inches; yellowish brown (10YR 5/6) clay loam; few medium distinct light brownish gray (2.5Y 6/2) mottles; weak medium prismatic structure parting to weak coarse angular blocky; firm; thin discontinuous clay films; at 21 to 23 inches, dark oxide accumulation; medium acid; clear smooth boundary.

B25t—31 to 40 inches; yellowish brown (10YR 5/6) light clay loam; few medium distinct light brownish gray (2.5Y 6/2) mottles; weak medium prismatic structure; firm; thin discontinuous clay films; slightly acid; clear smooth boundary.

C1—40 to 51 inches; yellowish brown (10YR 5/6) loam; few fine distinct light brownish gray (10YR 6/2) mottles; massive; vertical cleavage; friable; few fine calcium carbonate nodules; strong effervescence; moderately alkaline; clear smooth boundary.

C2—51 to 60 inches; yellowish brown (10YR 5/6) loam; massive; friable; few fine calcium carbonate nodules; strong effervescence; moderately alkaline.

The solum ranges from 30 to 50 inches in thickness. Carbonates are as shallow as 40 inches.

The A1 horizon is very dark gray (10YR 3/1), very dark grayish brown (10YR 3/2), or dark grayish brown (10YR 4/2). The A2 horizon has hue of 10YR, value of 4 to 6, and chroma of 2 to 4. In cultivated areas the Ap horizon has use of 10YR, value of 4 or 5, and chroma of 2 to 5. Typically, the A horizon is loam but ranges to silt loam or clay loam. The B2 horizon is loam but ranges to silt loam or clay loam. The B2 horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. In some places the lower part of the B2 horizon is mottled. Reaction in the B horizon ranges from slightly acid to strongly acid.

Marshan series

The Marshan series consists of poorly drained soils on benches along streams and in drainageways that are filled with erosional sediment. These soils formed in about 32 to 40 inches of loamy material underlain by sand and gravel. They are moderately permeable in the loamy material and rapidly permeable in the sand and gravel. Slope ranges from 0 to 2 percent.

The Marshan soils are commonly adjacent to Colo, Udolpho, Lawler, and Maxfield soils. The Colo soils formed in alluvial, silty sediment and are on bottom lands. The Udolpho and Lawler soils are somwhat poorly drained and have a browner B horizon than the Marshan soils. The Maxfield soils are underlain by glacial till at a depth of 3 feet.

Typical pedon of Marshan clay loam, 32 to 40 inches to sand and gravel, 0 to 2 percent slopes, in a cultivated field on a nearly level terrace along streams; 2,060 feet west and 340 feet south of the northeast corner of sec. 25, T. 81 N., R. 3 E.

Ap—0 to 8 inches; black (N 2/0) light clay loam; moderate fine subangular blocky structure; friable; neutral; clear smooth boundary.

A12—8 to 13 inches; black (N 2/0) light clay loam; weak fine subangular blocky structure parting to moderate fine granular; friable; neutral; clear smooth boundary.

A3—13 to 17 inches; black (10YR 2/1) clay loam that has dark grayish brown (10YR 4/2) coatings on peds; very dark gray (5Y 3/1) rubbed; friable; neutral; clear smooth boundary.

B21g—17 to 23 inches; dark gray (5Y 4/1) heavy loam that has very dark gray (10YR 3/1) coatings on faces of peds; few fine faint olive gray (5Y 5/2) and light olive gray (5Y 6/2) and few fine distinct strong brown (7.5YR 5/6) mottles; weak medium and fine subangular blocky structure; friable; neutral; gradual smooth boundary.

B22g—23 to 29 inches; olive gray (5Y 5/2) loam; common fine faint dark gray (5Y 4/1) and common fine distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; neutral; gradual smooth boundary.

B23g—29 to 38 inches; olive gray (5Y 5/2) loam; few fine distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; neutral; gradual smooth boundary.

IIC—38 to 60 inches; light olive gray (5Y 5/2) coarse sand; few fine distinct yellowish brown (10YR 5/6) mottles; single grained; loose; neutral.

Thickness of the solum and depth to the sand and gravel typically is 32 to 40 inches but can be as shallow as 30 inches.

The A horizon is black (10YR 2/1 or N 2/0) or very dark gray (10YR 3/1). It is 14 to 24 inches thick. It is typically clay loam, but ranges to silty clay loam and loam. The B horizon has hue of 5Y, 2.5Y, or 10YR; value of 4 or 5; and chroma of 1 or 2. The B horizon is silty clay loam, clay loam, or loam. Reaction in the B horizon is slightly acid or neutral. The IIC horizon can be loam or sandy loam in the upper part, but gravelly sand or coarse sand is at a depth of 30 or 40 inches.

Maxfield series

The Maxfield series consists of poorly drained, moderately permeable soils at the heads of broad, shallow drainageways. These soils are in uplands. They formed in about 24 to 40 inches of loess and in the underlying glacial till. Slope ranges from 0 to 2 percent.

The Maxfield soils are similar to Ansgar soils. They are commonly adjacent to Klinger and Sawmill soils. The Klinger soils are somewhat poorly drained and have a browner B horizon than the Maxfield soils. The Sawmill soils formed in silty alluvium. Unlike the Maxfield soils, they do not have glacial till within a depth of 60 inches or more. The Ansgar soils have an A2 horizon.

Typical pedon of Maxfield silty clay loam, 0 to 2 percent slopes, in a cultivated field on a concave slope at the head of a drainageway, in uplands; 250 feet north and 357 feet east of the southwest corner of sec 12, T. 81 N., R. 2 E.

Ap—0 to 8 inches; black (N 2/0) silty clay loam; moderate fine granular structure; friable; neutral; clear smooth boundary.

A12—8 to 15 inches; black (N 2/0) silty clay loam; moderate fine granular structure; friable; neutral; clear smooth boundary.

A3—15 to 19 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) kneaded; few fine faint dark gray (10YR 4/1) mottles; moderate fine subangular blocky structure parting to moderate fine granular; friable; few roots; neutral; clear smooth boundary.

B21—19 to 26 inches; olive gray (5Y 4/2) silty clay loam that has dark gray (10YR 4/1) coatings on faces of peds; common fine distinct grayish brown (2.5Y 5/2), few fine distinct light yellowish brown (2.5Y 6/4), and few fine faint yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; friable; at a depth of 25 to 29 inches, dark krotovina; neutral; clear smooth boundary.

B22—26 to 36 inches; grayish brown (2.5Y 5/2) light silty clay loam; few fine distinct yellowish brown (10YR 5/6) mottles; weak medium and fine subangular blocky structure; firm; few fine black (10YR 2/1) oxides; neutral; abrupt smooth boundary.

IIB31—36 to 41 inches; yellowish brown (10YR 5/6) sandy loam; massive; firm; few fine distinct light brownish gray (10YR 6/2) mottles; few medium pebbles; few fine black (10YR 2/1) and dark yellowish brown (10YR 4/4) oxides; neutral; abrupt smooth boundary.

IIB32—41 to 46 inches; yellowish brown (10YR 5/6) heavy loam; weak coarse prismatic structure; firm; few fine yellowish red (5YR 5/8) iron concretions; few fine pebbles; slightly acid; gradual smooth boundary.

IIC—46 to 60 inches; yellowish brown (10YR 5/6) heavy loam; few fine distinct light gray (5Y 6/1) mottles; massive; firm; few fine black (10YR 2/1) oxide concretions; few fine reddish brown (5Y 4/4) iron oxides; slightly acid.

The solum is typically about 48 inches thick but ranges from 40 to 55 inches in thickness. The loess is typically 24 to 40 inches thick but ranges from 20 to 42 inches in thickness. Carbonates are at a depth of 40 to 60 inches or more.

The A horizon is black (N 2/0 or 10YR 2/1) and very dark gray (10YR 3/1). The upper part of the B horizon has hue of 2.5Y or 5Y, value of 4 or 5, and chroma of 1 or 2. The B horizon ranges from silt loam to silty clay loam. Soil reaction in the B horizon is typically neutral but ranges to slightly acid. The IIB2 horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 8. Mottles have lower chroma. The IIB3 horizon is typically loam and ranges to sandy loam, clay loam, and sandy clay loam. A thin layer of loamy sand or sand, typically less than 10 inches thick, commonly separates the loess from the glacial till.

Medary series

The Medary series consists of moderately well drained, slowly permeable soils on escarpments of high benches along streams. These soils formed in lacustrine sediments along the Mississippi River and its tributaries. Slope ranges from 18 to 30 percent.

The soils contain more clay in the argillic horizon than is defined at the range for the Medary series. This difference does not alter the usefulness and behavior of these soils.

The Medary soils are commonly adjacent to Chaseburg and Zwingle soils. The Chaseburg soils formed in stratified, silty alluvium and are on the flood plain. The Zwingle soils have a grayer B horizon than the Medary soils. They are above the Medary soils in the same landscape.

Typical pedon of Medary silt loam, 18 to 30 percent slopes, in a timbered pasture on an escarpment of a high bench along a stream; 1,220 feet east and 720 feet south of the northwest corner of sec. 12, T 80 N., R. 5 E.

A1—0 to 4 inches; very dark grayish brown (10YR 3/2) silt loam, light brownish gray (10YR 6/2) dry; moderate fine granular structure; friable; thin

discontinuous silt coatings on faces of peds; slightly acid; abrupt smooth boundary.

A2—4 to 8 inches; reddish brown (5YR 5/3) silt loam, light gray (10YR 7/2) dry; moderate medium platy structure parting to moderate fine subangular blocky; friable; thin discontinuous brown (7.5YR 5/2) coatings on faces of peds; many fine dark reddish brown (5YR 3/2) oxides; slightly acid; clear smooth boundary.

B1—8 to 15 inches; reddish brown (5YR 4/4) silty clay loam; moderate fine and medium angular blocky and subangular blocky structure; friable; thin discontinuous brown (7.5YR 5/2) coatings on faces of peds; common fine reddish brown (5YR 3/2) oxides; medium acid; clear smooth boundary.

B21t—15 to 24 inches; reddish brown (5YR 4/4) silty clay; moderate medium angular blocky and subangular blocky structure; firm; thin discontinuous brown (7.5YR 4/2) coatings on faces of peds; thin discontinuous clay films and filled pores; few dark reddish brown (5YR 2/2) oxides; medium acid; gradual smooth boundary.

B22t—24 to 32 inches; reddish brown (5YR 4/4) silty clay; moderate medium prismatic structure parting to moderate medium angular blocky and subangular blocky; firm; thin discontinuous brown (7.5YR 4/4) coatings on faces of peds; thin discontinuous clay films; few very dark gray (10YR 3/1) filled pores; medium acid; gradual smooth boundary.

B3t—32 to 38 inches; reddish brown (5YR 4/4) light silty clay; weak medium prismatic structure; firm; few very dark gray (10YR 3/1) clay lined pores; slightly acid; gradual smooth boundary.

C1—38 to 48 inches; dark red (2.5YR 3/6) silty clay and 1/2 to 1/4 inch strata of reddish brown (5YR 5/4) silt loam; weak coarse prismatic structure; firm; neutral; clear wavy boundary.

C2—48 to 60 inches; dark reddish brown (5YR 3/3) clay; few fine prominent gray (10YR 5/1) mottles; massive; firm; common fine reddish brown (5YR 5/4) strata; mildly alkaline.

The solum ranges from 30 to 40 inches in thickness. The A1 horizon has hue of 10YR, value of 3 to 5, and chroma of 1 to 3. It is 3 to 6 inches thick. The A2 horizon has hue of 10YR to 5YR, value of 4 or 5, and chroma of 1 to 3. It is 3 to 5 inches thick. In cultivated areas the A2 horizon is incorporated into the Ap horizon. The A horizon is usually silt loam but is silty clay loam in eroded or cultivated areas. The B horizon has hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 3 to 6. Reaction in the B horizon is slightly acid to medium acid. The C horizon has hue of 5YR or 2.5YR, value of 3 to 5, and chroma 3 to 6.

Mt. Carroll series

The Mt. Carroll series consists of well drained, moderately permeable soils on ridges and side slopes. These soils are in the uplands. They formed in thick loess deposits near major streams and rivers. Slope ranges from 5 to 18 percent.

The Mt. Carroll soils are commonly adjacent to Downs, Fayette, and Timula soils. The Downs and Fayette soils have a B horizon of silty clay loam. The Timula soils are calcareous at a depth of 2 to 3 feet.

Typical pedon of Mt. Carroll silt loam, 9 to 14 percent slopes, moderately eroded, in a permenent pasture on a north-facing, convex side slope, in uplands; 320 feet south and 2,575 feet east of the northwest corner of sec. 25, T 83 N., R 6 E.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam intermixed with some brown (10YR 4/3); weak fine granular structure; friable; medium acid; abrupt smooth boundary.

B1—8 to 14 inches; brown (10YR 4/3) silt loam; weak fine subangular blocky structure; friable; thin patchy silt coatings on faces of peds; slightly acid; clear smooth boundary.

B21—14 to 21 inches; brown (7.5YR 4/4) heavy silt loam; weak fine and medium subangular blocky structure; friable; thin discontinuous silt coatings on faces of peds; medium acid; gradual smooth boundary.

B22t—21 to 29 inches; brown (7.5YR 4/4) heavy silt loam; weak fine and medium subangular blocky structure; friable; thin discontinuous silt coatings on faces of peds; thin discontinuous clay films; medium acid; gradual smooth boundary.

B3t—29 to 41 inches; brown (7.5YR 5/4) silt loam; weak medium and coarse angular blocky structure; friable; thin discontinuous silt coatings on faces of peds; thin discontinuous clay films in root channels; medium acid; gradual smooth boundary.

C—41 to 55 inches; yellowish brown (10YR 5/6) silt loam; massive; vertical cleavage; very thin patchy silt coatings on faces of peds; friable; medium acid; gradual smooth boundary.

C2—55 to 60 inches; yellowish brown (10YR 5/6) silt loam; few fine faint grayish brown (10YR 5/2) mottles; massive; some vertical cleavage; friable; few fine soft oxides; medium acid.

The Ap or A1 horizon is typically 6 to 8 inches thick. It is black (10YR 2/1), very dark grayish brown (10YR 3/2), or dark brown (10YR 3/3). Typically, the A2 horizon is incorporated into the Ap horizon by cultivation. The B horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 5. The B horizon typically is silt loam and ranges in clay content from 18 to 27 percent. Typically, reaction in the B horizon is medium acid to neutral.

Muscatine series

The Muscatine series consists of somewhat poorly drained, moderately permeable soils on divides in

uplands and on loess-covered benches along streams. These soils formed in loess that is 60 inches or more deep. Slope ranges from 0 to 3 percent.

Muscatine soils are similar to Atterberry soils and are commonly adjacent to Garwin and Tama soils. The Atterberry soils have a thinner A1 horizon than the Muscatine soils. The Garwin soils are poorly drained and have a grayer B horizon. The well drained Tama soils have a browner B horizon.

Typical pedon of Muscatine silt loam, 1 to 3 percent slopes, in a cultivated field on a west-facing, convex ridgetop, in uplands; 270 feet east and 2,232 feet north of the southwest corner of sec 12, T. 81. N., R. 5 E.

Ap—0 to 8 inches; black (10YR 2/1) heavy silt loam; weak fine granular structure; friable; neutral; abrupt smooth boundary.

A12—8 to 15 inches; black (10YR 2/1) heavy silt loam; moderate fine granular structure; friable; slightly acid; clear wavy boundary.

A13—15 to 19 inches; very dark brown (10YR 2/2) light silty clay loam; moderate fine and medium granular structure; friable; medium acid; clear smooth boundary.

B1t—19 to 26 inches; dark grayish brown (10YR 4/2) light silty clay loam that has very dark grayish brown (10YR 3/2) coatings on faces of peds; weak fine subangular blocky structure; friable; thin discontinuous very dark grayish brown (2.5Y 3/2) clay films; medium acid; clear wavy boundary.

B21t—26 to 31 inches; grayish brown (10YR 5/2) silty clay loam that has dark brown (10YR 3/3) coatings on faces of peds; many fine distinct yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; friable; thin discontinuous very dark brown (2.5Y 3/2) clay films; slightly acid; clear wavy boundary.

B22t—31 to 39 inches; grayish brown (10YR 5/2) silty clay loam; common fine faint strong brown (7.5YR 5/6) mottles; moderate coarse subangular blocky structure parting to moderate medium subangular blocky; friable; nearly continuous clay films; few fine dark oxides; slightly acid; gradual smooth boundary.

B23t—39 to 54 inches; mottled grayish brown (10YR 5/2) and strong brown (7.5YR 5/6) light silty clay loam; weak medium prismatic structure parting to weak medium subangular blocky; friable; few fine dark oxides; thin discontinuous clay films; slightly acid; clear wavy boundary.

C—54 to 60 inches; mottled grayish brown (2.5Y 5/2) and yellowish brown (10YR 5/6) silt loam; massive; friable; few fine dark oxides; neutral.

The solum ranges from 40 to 60 inches or more in thickness. The A horizon ranges from black (10YR 2/1) and very dark gray (10YR 3/1) to very dark brown (10YR 2/2) and very dark grayish brown (10YR 3/2). It is 14 to 20 inches thick. The B horizon has hue of 10YR and 2.5Y, value of 4 to 5, and chroma of 2. Mottles have higher chroma. The B2 horizon is silt loam or silty clay loam and ranges in content of clay from about 26 to 34 percent. Reaction in the B horizon is slightly acid to strongly acid.

Nevin series

The Nevin series consists of somewhat poorly drained, moderately permeable soils on benches along major streams. These soils formed in silty alluvium. Slope ranges from 0 to 2 percent.

These soils have a higher B/A clay ratio than is defined as the range for the Nevin series. This difference does not alter the usefulness and behavior of these soils.

The Nevin soils are similar to Raddle soils and are commonly adjacent to Colo and Raddle soils. The Colo soils have a thicker A horizon and are poorly drained. The Raddle soils are well drained. The Colo soils have a grayer B horizon than the Nevin soils, and the Raddle soils have a browner one.

Typical pedon of Nevin silty clay loam, 0 to 2 percent slopes, in a cultivated field on a level, low terrace along streams; 2,470 feet south and 425 feet east of the northwest corner of sec. 6, T 83 N., R 2 E.

Ap—0 to 9 inches; black (10YR 2/1) light silty clay loam; cloddy parting to weak fine and medium granular structure; friable; slightly acid; abrupt smooth boundary.

A12—9 to 18 inches; black (10YR 2/1) light silty clay loam; weak fine and medium granular structure; friable; slightly acid; clear smooth boundary.

A3—18 to 24 inches; very dark grayish brown (10YR 3/2) silty clay loam; weak fine and very fine subangular blocky structure; friable; few fine faint dark gray (10YR 3/1) coatings on faces of peds; slightly acid; clear smooth boundary.

B21—24 to 32 inches; grayish brown (10YR 5/2) silty clay loam that has dark brown (10YR 4/2) coatings on faces of peds; few fine distinct yellowish brown (10YR 5/6) mottles; weak fine and medium subangular blocky structure; friable; few fine dark oxides; slightly acid; gradual smooth boundary.

B22t—32 to 40 inches; grayish brown (10YR 5/2) silty clay loam; common fine distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to weak medium subangular blocky; friable; few fine discontinuous clay films; few fine dark oxides; slightly acid; gradual smooth boundary.

B23t—40 to 46 inches; grayish brown (2.5Y 5/2) light silty clay loam; common fine distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to weak coarse subangular blocky; friable; few fine prominent reddish brown (5YR 4/4) iron oxides; few thin discontinuous clay films; slightly acid; gradual smooth boundary.

B3—46 to 58 inches; light brownish gray (2.5Y 6/2) light silty clay loam; weak coarse prismatic structure; friable; common fine distinct strong brown (7.5YR 5/6) soft oxides; few grayish brown (10YR 5/2) stains on vertical cleavage faces of peds; few fine dark oxides, neutral; gradual smooth boundary.

C—58 to 60 inches; mottled strong brown (7.5YR 5/6) and light brownish gray (2.5Y 6.2) silt loam; massive; friable; few fine olive (5Y 4/4) oxides; neutral.

The solum is more than 40 inches thick but ranges from 36 to 60 inches in thickness. The A horizon is black (10YR 2/1), very dark gray (10YR 3/1), or very dark grayish brown (10YR 3/2). It is 18 to 30 inches thick. The A horizon is typically silty clay loam but ranges to silt loam. The B2 horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 or 3. The mottles have high chroma. Reaction in the B horizon ranges from neutral to slightly acid.

Nordness series

The Nordness series consists of well drained soils on side slopes and narrow ridgetops. These soils are in uplands and on high, bench-shaped areas. They formed in less than 20 inches of silty material over limestone bedrock. They have moderate permeability, except in the thin layer above the limestone, where permeability is slow. Slope ranges from 5 to 60 percent.

The Nordness soils are similar to Sogn soils and are commonly adjacent to Fayette soils. The Fayette soils formed in loess. Unlike the Nordness soils, they have no limestone bedrock within a depth of 60 inches or more. The Sogn soils have a thicker A1 horizon than the Nordness soils but do not have an A2 horizon.

Typical pedon of Nordness silt loam, 5 to 14 percent slopes, in a permeanent pasture on a west-facing, narrow, convex ridgetop, in uplands; 840 feet south and 1,000 feet east of the northwest corner of sec. 4, T. 83 N., R. 1 E.

A1—0 to 4 inches; very dark grayish brown (10YR 3/2) silt loam; weak fine granular structure; friable; neutral; clear smooth boundary.

A2—4 to 7 inches; brown (10YR 4/3) silt loam; moderate thin platy structure; friable; medium acid; clear smooth boundary.

B21—7 to 12 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate fine subangular blocky structure; firm; medium acid; abrupt irregular boundary.

IIB22t—12 to 15 inches; yellowish red (5YR 4/6) clay loam; weak medium subangular blocky structure; firm; few chert fragments and thin discontinuous clay films; medium acid; abrupt broken boundary.

IIR—15 inches; hard fractured limestone bedrock; reddish clay loam between fractures.

The thickness of the solum and depth to limestone bedrock ranges from 8 to 20 inches. The A1 horizon is 1 to 4 inches thick. It has hue of 10YR, value of 3 or 4, and chroma of 1 or 2. The A2 horizon is 2 to 4 inches thick. It is frequently incorporated in the Ap horizon during cultivation. The B horizon is 6 to 12 inches thick. It has hue of 10YR or 7.5YR. Reaction in the A and B horizons ranges from neutral to medium acid. The IIB horizon, or residuum, can be absent or as thick as 6 inches. It is silty clay loam or clay loam.

Olin series

The Olin series consists of well drained soils in uplands. These soils formed in 20 to 36 inches of sandy loam and in the underlying glacial till. They are moderately rapidly permeable in the sandy material and moderately permeable in the glacial till. Slope ranges from 2 to 5 percent.

The Olin soils are similar to Dickinson soils, loam substratum. The Olin soils are commonly adjacent to Aredale, Dickinson, Kenyon, and Sparta soils. The Dickinson soils, loam substratum, are underlain by glacial till at a depth of 40 to 60 inches. The Aredale soils have a finer texture. The Kenyon soils have underlying glacial till at a depth of 2 feet. The Dickinson and Sparta soils have coarser textures than the Olin soils. Unlike the Olin soils, they do not have glacial till within a depth of 60 inches or more.

Typical pedon of Olin fine sandy loam, 2 to 5 percent slopes, in a cultivated field on a south-facing, convex side slope, in uplands; 885 feet north and 2,040 feet east of the southwest corner of sec. 32, T. 83 N., R. 1 E.

Ap—0 to 8 inches; very dark brown (10YR 2/2) fine sandy loam; weak fine granular structure; very friable; slightly acid; clear smooth boundary.

A12—8 to 14 inches; very dark brown (10YR 2/2) fine sandy loam; weak fine subangular blocky structure parting to weak fine granular; very friable; medium acid; clear smooth boundary.

A3—14 to 19 inches; very dark grayish brown (10YR 3/2) fine sandy loam; weak fine subangular blocky structure; very friable; medium acid; clear smooth boundary.

B1—19 to 25 inches; brown (10YR 4/3) fine sandy loam that has dark brown (10YR 3/3) coatings on faces of peds; brown (10YR 4/3) kneaded; weak fine subangular blocky structure; very friable; medium acid; abrupt smooth boundary.

IIB2—25 to 34 inches; yellowish brown (10YR 5/4) loam that has brown (10YR 5/3) coatings on faces of peds; few fine faint grayish brown (10YR 5/2) and yellowish brown (10YR 5/8) mottles; weak coarse subangular blocky structure parting to weak fine subangular blocky; firm; common fine dark reddish brown (5YR 2/2) oxides; medium acid; gradual smooth boundary.

IIB3—34 to 46 inches; yellowish brown (10YR 5/4) heavy loam that has grayish brown (2.5Y 5/2) coatings on faces of peds; medium fine distinct grayish brown (10YR 5/2) mottles; moderate medium prismatic structure parting to weak medium subangular blocky; firm; slightly acid; gradual smooth boundary.

IIC—46 to 60 inches yellowish brown (10YR 5/6) heavy loam; medium fine distinct grayish brown (2.5Y 5/2) mottles; neutral.

The solum ranges from 40 to 60 inches in thickness. Carbonates range as deep as 50 to 80 inches and generally correspond to the thickness of the solum.

The A horizon is 14 to 24 inches thick. It generally decreases in thickness as slope increases. The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The IIB2 horizon has hue of 10YR; value of 3, 4, or 5; and chroma of 3 or 4. In places a dark brown (10YR 3/3) or brown (10YR 4/3) B1 horizon is present. The B horizon that is in the material that is over glacial till centers on sandy loam; however, layers of loamy sand, 6 to 8 inches thick, are not excluded. A pebble band is sometimes present in the lower part of the sandy loam material or in the upper part of the IIB2 horizon. In the lower part of the IIB2 horizon, below a depth of 30 inches, mottles can have chroma of 2 or lower. These mottles increase in size and number as depth increases. The IIB2 horizon is commonly loam but ranges to silty clay loam or sandy clay loam. The IIC2 horizon has hue of 10YR or 7.5YR; value of 4, 5, or 6; and chroma of 4 through 8. It has some grayish mottles. Reaction ranges from medium to strongly acid in the IIB2 horizon.

Palms series

The Palms series consists of very poorly drained organic soils in seeps on hillsides, in drainageways in uplands; and in shallow depressions on alluvial flood plains. These soils formed in 10 to 40 inches of organic material over alluvium or glacial till. They are moderately rapidly permeable in the organic material and moderately permeable in the underlying alluvium or glacial till. Slope ranges from 0 to 3 percent.

The Palms soils are commonly adjacent to Clyde soils on uplands and Colo and Marshan soils on bottom lands and stream benches. The Clyde soils are loamy and are underlain by glacial till at a depth of 4 feet. The Colo soils are silty clay loam. The Marshan soils are loamy and are underlain by sand and gravel at 3 feet.

Typical pedon of Palms muck, 0 to 3 percent slopes, in a cultivated field of a depressional flood plain; 1,680 feet south and 1,310 feet east of the northwest corner of sec. 4, T. 82 N., R. 5 E.

Oa1—0 to 13 inches; black (N 2/0) sapric material; weak medium subangular blocky structure; friable; 2 to 3 percent herbaceous fiber; 10 percent mineral matter; many roots; mildly alkaline; gradual smooth boundary.

Oa2—13 to 29 inches; black (N 2/0) sapric material; weak coarse subangular blocky structure; friable; 3 to 5 percent herbaceous fiber; 10 percent mineral matter; few roots; neutral gradual smooth boundary.

Oa3—29 to 39 inches; black (10YR 2/1) sapric material; weak coarse prismatic structure; friable; 3 to 5 percent herbaceous fiber; 10 percent mineral matter; neutral; abrupt smooth boundary.

IICg—39 to 60 inches; gray (5Y 5/1) and black (10YR 2/1) light silty clay loam that has some very dark grayish brown (2.5Y 5/2); massive; friable; neutral.

The organic matter is generally 20 to 40 inches thick, but in places it is as much as 50 inches thick. It is black (10YR 2/1) or very dark brown (10YR 2/2). Reaction in the organic horizon is typically neutral but ranges from slightly acid to mildly alkaline. The IIC horizon is black (10YR 2/1) to olive gray (5Y 5/2) and light olive gray (5Y 6/2). This material is variable in texture but is typically silty clay loam, loam, or silt loam that contains sandy strata in places.

Raddle series

The Raddle series consists of well drained, moderately permeable soils on benches along major streams. These soils formed in silty alluvium. Slope ranges from 0 to 2 percent.

The Raddle soils are commonly adjacent to Colo and Nevin soils. The Colo soils have a thicker A horizon and are poorly drained. The Nevin soils are somewhat poorly drained. The Colo and Nevin soils have a grayer B horizon than the Raddle soils.

Typical pedon of Raddle silt loam, 0 to 2 percent slopes, in a cultivated field on a level terrace along a stream; 1,245 feet west and 420 feet south of the northeast corner of sec 5, T. 82 N., R. 1 E.

Ap—0 to 7 inches; black (10YR 2/1) silt loam; weak fine granular structure; friable; neutral; clear smooth boundary.

A12—7 to 13 inches; black (10YR 2/1) silt loam; weak fine subangular blocky structure; friable; slightly acid; gradual smooth boundary.

A3—13 to 19 inches; very dark grayish brown (10YR 3/2) silt loam; weak fine and medium subangular blocky structure; friable; medium acid; gradual smooth boundary.

B21—19 to 24 inches; brown (10YR 4/3) heavy silt loam; weak fine and medium subangular blocky structure; few discontinuous dark brown (10YR 3/3) coatings on faces of peds; friable; medium acid; gradual smooth boundary.

B22—24 to 37 inches; brown (10YR 5/3) heavy silt loam; weak medium subangular blocky structure; friable; medium acid; gradual smooth boundary.

B3—37 to 43 inches; yellowish brown (10YR 5/4) silt loam; weak medium prismatic structure; friable; thin nearly continuous brown (10YR 5/3) coatings on prism faces; medium acid; gradual smooth boundary.
C1—43 to 53 inches; brown (10YR 5/3) silt loam; common fine faint dark yellowish brown (10YR 4/4) mottles; massive friable; common fine dark oxides; medium acid; clear smooth boundary.
C2—53 to 56 inches; brown (10YR 5/3) silt loam; massive; friable; few medium brown (7.5YR 4/4) oxides; medium acid; clear smooth boundary.
C3—56 to 60 inches; brown (10YR 5/3) silt loam; massive; friable; few fine dark oxides; medium acid.

The solum ranges from 40 to 65 inches in thickness. The A1 horizon ranges in color from black (10YR 2/1) or very dark brown (10YR 2/2) to very dark grayish brown (10YR 3/2). The A horizon typically is 14 to 20 inches thick, but in places it is as much as 24 inches thick. The B2 horizon has hue of 10YR, value of 4 or 5, and chroma of 3 to 6. The B2 horizon is silt loam that has a clay content of about 18 to 24 percent. Typically, the B3 horizon increases in sand content and is silt loam ranging to loam. In places sandy loam is below a depth of 50 inches. Reaction in the B horizon is medium acid to strongly acid.

Readlyn series

The Readlyn series consists of somewhat poorly drained, moderately permeable soils in swales of ridges and at slightly concave heads of drainageways. These soils are in uplands. They formed in 14 to 24 inches of loamy material and in the underlying glacial till. Slope ranges from 1 to 3 percent.

The Readlyn soils are commonly adjacent to Clyde, Kenyon, and Maxfield soils. The Clyde soils are poorly drained and have glacial till at a depth of 4 feet. The Kenyon soils are moderately well drained and have a browner B horizon than the Readlyn soils. The Maxfield soils, formed in silty material over glacial till, are poorly drained. The Clyde and Maxfield soils have a grayer B horizon than the Readlyn soils.

Typical pedon of Readlyn loam, 1 to 3 percent slopes, in a cultivated field on a southwest-facing, convex side slope, in uplands; 570 feet north and 2,040 feet east of the southwest corner of sec. 32, T. 83 N., R. 1 E.

Ap—0 to 7 inches; black (10YR 2/1) loam; cloddy structure parting to weak fine subangular blocky; friable; medium acid; abrupt smooth boundary.
A12—7 to 14 inches; black (10YR 2/1) loam; weak fine and very fine subangular blocky structure; friable; medium acid; clear smooth boundary.
B1—14 to 19 inches; dark grayish brown (10YR 4/2) and yellowish brown (10YR 5/4) loam; many fine faint yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; friable; medium acid; clear wavy boundary.
IIB21—19 to 26 inches; light olive brown (2.5Y 5/4) heavy loam; common fine faint dark grayish brown (2.5Y 4/2) mottles; weak medium prismatic structure parting to weak medium subangular blocky; firm; few pebbles; slightly acid; clear smooth boundary.
IIB22t—26 to 38 inches; yellowish brown (10YR 5/6) heavy loam; common fine distinct grayish brown (2.5Y 5/2) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; thin discontinuous clay films; neutral; clear smooth boundary.
IIB3—38 to 47 inches; yellowish brown (10YR 5/6) loam; few medium distinct grayish brown (2.5Y 5/2) mottles; weak medium prismatic structure; firm; neutral; clear smooth boundary.
IIC1—47 to 55 inches; yellowish brown (10YR 5/6) loam; few medium distinct grayish brown (2.5Y 5/2) mottles; massive; firm; neutral; abrupt smooth boundary.
IIC2—55 to 60 inches; yellowish brown (10YR 5/6) loam; few fine distinct grayish brown (2.5Y 5/2) mottles; massive; firm; strong effervescence; mildly alkaline.

The solum is typically 40 to 60 inches in thickness. Carbonates are lacking throughout the solum.

The A horizon is typically black (10YR 2/1) or very dark brown (10YR 2/2) but ranges to very dark gray (10YR 3/1) or very dark grayish brown (10YR 3/2) in the lower part. The A horizon is 12 to 20 inches thick. It is typically loam but ranges to silty clay loam or silt loam that is high in content of sand. The B horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 8. Reaction in the B horizon ranges from neutral to medium acid. The IIB and IIC horizons are loam, clay loam, or sandy clay loam.

Ripon series

The Ripon series consists of well drained, moderately permeable soils in uplands. These soils formed in 20 to 40 inches of loess and a thin layer of clay residuum, which is over limestone bedrock. Slope ranges from 2 to 9 percent slopes.

These soils do not have an argillic horizon or a component of glacial till in the solum. They contain more clay in the lowest subhorizon of the B horizon than is defined as the range of the Ripon series. These differences, however, do not alter the usefulness and behavior of these soils.

The Ripon soils are commonly adjacent to Sogn and Tama soils. The Sogn soils are shallower to limestone bedrock than the Ripon soils. Tama soils, however, do not have limestone bedrock within a depth of 60 inches.

Typical pedon of Ripon silt loam, 20 to 30 inches to limestone, 2 to 5 percent slopes, in a permanent pasture on an east-facing, convex slope; 300 feet east and 180 feet north of the southwest corner of sec. 27, T. 82 N., R. 1 E.

A1—0 to 13 inches; very dark brown (10YR 2/2) heavy silt loam; weak fine granular structure; friable; slightly acid; gradual smooth boundary.

A2—13 to 18 inches; very dark grayish brown (10YR 3/2) light silty clay loam; moderate medium subangular blocky structure; friable; strongly acid; gradual smooth boundary.

B21—18 to 26 inches; brown (10YR 4/3) light silty clay loam; moderate medium subangular blocky structure; firm; very dark grayish brown (10YR 3/2) and dark brown (10YR 3/3) coatings on face of peds; medium acid; clear smooth boundary.

IIB3—26 to 29 inches; reddish brown (5YR 4/4) clay; moderate medium angular blocky structure; firm; few small fragments of limestone, soft weathered limestone as depth increases; neutral; abrupt broken boundary.

IIR—29 inches; fractured limestone bedrock, reddish brown (5YR 4/4) clay residuum in fractures.

Thickness of the solum and depth to limestone bedrock ranges from 20 to 40 inches. The A horizon is 10 to 18 inches thick. It is black (10YR 2/1), very dark brown (10YR 2/2), or very dark grayish brown (10YR 3/2). It is predominantly silt loam but ranges to silty clay loam. The B2 horizon is brown (10YR 3/3) to yellowish brown (10YR 5/6). It is silt loam to silty clay loam. The IIB horizon, which formed in residuum weathered from limestone, is 2 to 6 inches thick. It is clay or silty clay.

Rockton series

The Rockton series consists of well drained, moderately permeable soils on uplands. These soils formed in 20 to 40 inches of loamy material and in a thin layer of residuum over limestone bedrock. Slope ranges from 2 to 9 percent.

Rockton soils are commonly adjacent to Bertram and Sogn soils. The Bertram soils are sandy loam. The Sogn soils are shallower to limestone bedrock than the Rockton soils.

Typical pedon of Rockton loam, 20 to 30 inches to limestone, 2 to 5 percent slopes, in a cultivated field on a south-facing back slope, in uplands; 1,640 feet west and 1,680 feet south of the northeast corner of sec. 21, T. 81 N., R. 5 E.

Ap—0 to 9 inches; black (10YR 2/1) loam; weak medium subangular blocky structure parting to weak fine granular; friable; slightly acid; abrupt smooth boundary.

A3—9 to 14 inches; very dark grayish brown (10YR 3/2) loam; weak fine and very fine granular structure; friable; slightly acid; clear smooth boundary.

B21t—14 to 20 inches; dark yellowish brown (10YR 4/4) loam; very dark grayish brown (10YR 3/2) coatings on peds; weak fine and very fine subangular blocky structure; friable; thin discontinuous clay films; slightly acid; clear smooth boundary.

B22t—20 to 25 inches; brown (7.5YR 4/4) heavy loam; weak fine subangular blocky structure; friable; thin discontinuous clay films; neutral; abrupt wavy boundary.

IIR—25 inches; fractured limestone bedrock.

The thickness of the solum and depth to limestone bedrock ranges from 20 to 40 inches. The A horizon is 10 to 18 inches thick. It is black (10YR 2/1), very dark brown (10YR 2/2), or very dark grayish brown (10YR 3/2). The A horizon is typically loam but ranges to silt loam. The B2t horizon is brown (10YR 4/3) or yellowish brown (10YR 5/6) in the upper part and has hue of 7.5YR or 10YR in the lower part. The Bt horizon is typically loam or clay loam that ranges in clay content from 25 to 35 percent. Reaction in the B horizon ranges from neutral to medium acid. The IIB horizon, or residuum, can be absent or only evident by rinds around limestone flags, or it can be as much as 6 inches thick. The IIB horizon is clay loam, clay, or silty clay.

Saude series

The Saude series consists of well drained soils on benches along streams and on outwash plains of uplands. These soils formed in 24 to 32 inches of loamy material and in the underlying coarse sand and gravel. They are moderately permeable in the loamy material and very rapidly permeable in the underlying sand and and gravel. Slope ranges from 0 to 9 percent.

The Saude soils are similar to Wapsie soils and are commonly adjacent to Dickinson, Lawler, and Waukee soils. The Dickinson soils have more sand in the A and B horizon than the Saude soils. Unlike the Saude soils, they do not have coarse sand or gravel within a depth of 5 feet or more. The Lawler soils are somewhat poorly drained and have a grayer B horizon. The Wapsie soils have an A2 horizon and a thinner A1 horizon than the Saude soils. The Waukee soils have coarse sand or gravel at a depth of 3 feet.

Typical pedon of Saude loam, 2 to 5 percent slopes, in a cultivated field, in uplands; 2,103 feet south and 2,184 feet west of the northeast corner of sec. 19, T. 81 N., R. 3 E.

Ap—0 to 8 inches; very dark brown (10YR 2/2) loam; weak fine granular structure; friable; slightly acid; clear smooth boundary.

A12—8 to 18 inches; very dark grayish brown (10YR 3/2) loam; weak fine subangular blocky structure parting to weak fine granular; friable; thin very dark brown (10YR 2/2) coatings on faces of peds; medium acid; clear smooth boundary.

B2—18 to 27 inches; brown (10YR 4/3) loam; weak fine subangular blocky structure; friable; thin dark brown (10YR 3/3) coatings on faces of peds; strongly acid; clear smooth boundary.

B3—27 to 30 inches; dark yellowish brown (10YR 4/4) sandy loam; weak coarse subangular blocky

structure; very friable; strongly acid; clear smooth boundary.

IIC1—30 to 44 inches; yellowish brown (10YR 5/6) fine and medium sand; single grained; loose; 2 percent fine gravel; medium acid; clear smooth boundary.

IIC1—44 to 60 inches; yellowish brown (10YR 5/4) fine and medium sand; single grained; loose; 5 percent fine pebbles; at 51 inches, discontinuous 1-inch band of brown (7.5YR 4/4) loamy sand; medium acid; clear smooth boundary.

The solum ranges from 24 to 40 inches in thickness. Contrasting textures are typically at a depth of 24 to 32 inches but can be as shallow as 18 inches.

The A1 or Ap horizon is black (10YR 2/1), very dark brown (10YR 2/2), or very dark grayish brown (10YR 3/2). The A horizon is 11 to 20 inches thick. It is typically loam but ranges to sandy loam. The B horizon has hue of 10YR, value of 4 or 5, and chroma of 3 to 6, but hue of 7.5YR is included in some pedons. The B horizon is typically loam that ranges in clay from 12 to 20 percent. The reaction in the B horizon is medium acid to strongly acid. The IIC horizon is primarily loamy sand and sand and some gravel. The percentage, by volume, of gravel in the IIC horizon ranges from 5 to 15 percent.

Sawmill series

The Sawmill series consists of poorly drained, moderately permeable soils on bottom lands along streams. These soils formed in silty, alluvial deposits. Slope ranges from 0 to 2 percent.

The Sawmill soils are similar to Colo soils and are commonly adjacent to Colo and Elvira soils. The Colo soils have a thicker A horizon. The Elvira soils have high concentrations of iron and manganese in the A and B horizon.

Typical pedon of Sawmill silty clay loam, 0 to 2 percent slopes, in a hayfield on a level flood plain; 1,740 feet west and 2,340 feet south of the northeast corner of sec. 7, T. 81 N., R. 1 E.

Ap—0 to 8 inches; black (N 2/0) silty clay loam; moderate fine subangular structure; firm; neutral; abrupt smooth boundary.

A3—8 to 12 inches; black (10YR 2/1) silty clay loam; weak fine subangular blocky structure; firm; neutral; gradual smooth boundary.

B1—12 to 27 inches; black (10YR 2/1) silty clay loam; moderate fine subangular blocky structure; firm; few fine hard concretions; neutral; gradual smooth boundary.

B2—27 to 33 inches; very dark gray (10YR 3/1) light silty clay loam; moderate fine subangular blocky structure; firm; neutral; clear wavy boundary.

B3—33 to 37 inches; olive gray (5Y 5/2) light silty clay loam; common fine distinct strong brown (7.5YR 5/6-5/8) mottles; weak coarse prismatic structure; friable; neutral; clear wavy boundary.

C1g—37 to 50 inches; light olive gray (5Y 6/2) loam; many fine distinct strong brown (7.5YR 5/6-5/8) mottles; massive; friable; common gray (5Y 2/1) channel fills; at a depth of 49 inches, 1-inch band of iron and manganese concretions, neutral; abrupt wavy boundary.

C2g—50 to 60 inches; light olive gray (5Y 6/2) silt loam; very few fine faint light olive brown (2.5Y 5/4) mottles; massive; friable; neutral.

The solum ranges from 36 to 50 inches in thickness. The A horizon is black (10YR 2/1) or very dark brown (10YR 2/2). It is 10 to 20 inches thick. The B horizon is black (10YR 2/1) or very dark gray (10YR 3/1) in the upper part. The lower part has hue of 2.5Y or 5Y; value of 4, 5, or 6; and chroma of 2, 3, or 4. Reaction in the B horizon ranges from neutral to slightly acid. The C horizon is loam, silt loam, or silty clay loam. In some pedons there are strata of less than 2 inches and concentrations of iron and manganese oxides. These oxides have hue of 7.5YR or 5YR; value of 4, 5, or 6; and chroma of 4 through 8.

Schley series

The Schley series consists of somewhat poorly drained, moderately permeable soils at concave heads and along side slopes of drainageways in uplands. These soils formed in stratified, loamy material and in the underlying glacial till, which is at a depth of 30 to 50 inches. Slope ranges from 1 to 4 percent.

These soils do not have an argillic horizon, and they contain a larger proportion of gray between the surface layer and middle part of the subsoil than is defined as the range for the Schley series. These differences do not alter the usefulness and behavior of these soils.

The Schley soils are commonly adjacent to Clyde, Kenyon, and Sparta soils. The Clyde soils are poorly drained and have a grayer B horizon than Schley soils. The Kenyon soils are moderately well drained and are underlain by glacial till at a depth of 2 feet. They have a browner B horizon than the Schley soils. The Sparta soils formed in sand. They do not have glacial till within a depth of 5 feet or more.

Typical pedon of Schley loam, 1 to 4 percent slopes, in a cultivated field on a north-facing, concave lower slope, in uplands; 1,610 feet east and 2,000 feet south of the northwest corner of sec. 31, T. 83 N., R. 1 E.

Ap—0 to 9 inches; black (10YR 2/1) loam, gray (10YR 5/1) dry; weak fine granular structure; friable; slightly acid; abrupt smooth boundary.

A2—9 to 14 inches; dark grayish brown (10YR 4/2) loam; common fine faint yellowish brown (10YR 5/6) mottles; weak coarse platy structure; friable; strongly acid; clear smooth boundary.

B1—14 to 20 inches; grayish brown (10YR 5/2) silty clay loam; common fine faint yellowish brown (10YR 5/6)

mottles; weak fine subangular blocky structure; friable; very strongly acid; clear wavy boundary.

B21—20 to 26 inches; grayish brown (10YR 5/2) silty clay loam; common fine faint yellowish brown (10YR 5/6) mottles; weak medium and fine subangular blocky structure; friable; strongly acid; clear smooth boundary.

B22t—26 to 34 inches; light brownish gray (2.5Y 6/2) loam; common fine distinct strong brown (7.5YR 5/6) mottles; weak medium and coarse subangular blocky structure; friable; thin discontinuous clay films; few fine dark reddish brown oxides; strongly acid; clear wavy boundary.

B3—34 to 44 inches; mottled light brownish gray (2.5Y 6/2) and strong brown (7.5YR 5/6) loamy sand; very weak medium and coarse subangular blocky structure; friable; medium acid; clear smooth boundary.

IIC1—44 to 56 inches; yellowish brown (10YR 5/6) loam; few fine faint light brownish gray (10YR 6/2) mottles; firm, slightly acid; abrupt smooth boundary.

IIC2—56 to 60 inches; brown (10YR 4/3) loam; massive; firm; few fine reddish brown oxides; neutral.

The solum is commonly about 40 to 50 inches thick but in places ranges to 66 inches in thickness. The Schley soils formed in stratified materials over glacial till, which is at a depth of 30 to 50 inches.

The Ap or A1 horizon is typically black (10YR 2/1), very dark gray (10YR 3/1), or very dark grayish brown (10YR 3/2). The A2 horizon is dark grayish brown (10YR 4/2) or grayish brown (10YR 5/2). It has mottles of higher chroma. It is about 5 to 10 inches thick. The A horizon is loam or silt loam that has a high content of sand.

The B horizon in the loamy material has hue of 2.5Y or 10YR, value of 4 or 5, and chroma or 2 to 4, but the mottles have higher chroma. It is loam, silt loam that is high in content of sand, or silty clay loam. The reaction in the B horizon ranges from medium to very strongly acid. A pebble band commonly separates the loamy material from the glacial till; loamy sand can be in this zone. The IIB3 or IIC horizon typically has hue of 10YR or 2.5Y hue, value of 4 to 6, and chroma of 2 to 6. The glacial till is typically loam, clay loam, or sandy clay loam. In some areas small pockets or strata of sandy loam are present in the glacial till.

Shaffton series

The Shaffton series consists of somewhat poorly drained, moderately permeable soils on flood plains. These soils formed in loamy, alluvial sediments. Slope ranges from 0 to 2 percent.

The Shaffton soils are commonly adjacent to Ambraw soils and the Wapsie Variant. The Ambraw soils are poorly drained and have a grayer B horizon than the Shaffton soils. The Wapsie Variant is well drained and has a browner B horizon.

Typical pedon of Shaffton loam, 0 to 2 percent slopes, in a cultivated field on a nearly level flood plain; 1,995 feet east and 2,030 feet north of the southwest corner of sec. 11, T. 81 N., R. 1 E.

Ap—0 to 8 inches; black (10YR 2/1) heavy loam; very dark brown (10YR 2/2) rubbed; weak fine granular structure; friable; medium acid; abrupt smooth boundary.

A3—8 to 13 inches; very dark grayish brown (10YR 3/2) loam; few fine faint dark yellowish brown (10YR 3/4) mottles; dark brown (10YR 3/3) rubbed; very weak coarse subangular blocky structure that tends toward platy; friable; strongly acid; clear smooth boundary.

B21—13 to 20 inches; brown (10YR 4/3) loam; few fine faint grayish brown (10YR 5/2) mottles; dark grayish brown (10YR 4/2) kneaded; very weak medium subangular blocky structure; friable; dark grayish brown (10YR 4/2) coatings on faces of peds; few fine dark reddish brown (5YR 3/3) hard oxide concretions; strongly acid; gradual smooth boundary.

B22—20 to 30 inches; mottled dark grayish brown (10YR 4/2) and brown (10YR 4/3) loam; dark grayish brown (10YR 4/2) kneaded; weak medium subangular blocky structure; friable; thin discontinuous grayish brown (10YR 5/2) coatings on faces of peds; few fine dark brown (7.5YR 4/4) soft oxides; strongly acid; gradual smooth boundary.

B31—30 to 36 inches; grayish brown (2.5Y 5/2) loam; many fine and medium distinct yellowish brown (10YR 5/4) and strong brown (7.5YR 5/6) mottles; very weak medium subangular blocky structure; friable; medium acid; clear smooth boundary.

B32—36 to 39 inches; grayish brown (2.5Y 5/2) loamy sand; common fine distinct yellowish brown (10YR 5/4) and strong brown (7.5YR 5/6) mottles; weak very coarse subangular blocky structure; very friable; medium acid; clear smooth boundary.

C1g—39 to 45 inches; gray (5Y 5/1) light silty clay loam; many fine distinct dark yellowish brown (10YR 4/4) mottles; massive; friable; few fine strong brown (7.5YR 4/4) oxides; slightly acid; clear wavy boundary.

IIC2—45 to 60 inches; grayish brown (10YR 5/2) coarse sand; single grained; loose; neutral.

The solum commonly is about 36 inches thick but ranges from 20 to 50 inches in thickness. Carbonates are absent in the solum and are not present within a depth of 60 inches or more.

The A horizon typically is 10 to 14 inches thick. It is black (10YR 2/1) to very dark grayish brown (10YR 3/2) in color. Typically, it is loam but ranges to clay loam or silt loam that is high in content of sand. The B horizon typically is dark grayish brown (10YR or 2.5Y 4/2) or grayish brown (2.5Y 5/2). Chroma can be 3, if mottles or faces of peds that have chroma of 2 or less are

common. The B2 horizon has few, fine, faint mottles that have hue of 10YR or 2.5Y, value of 4 or 6, and chroma of 4 to 6. Typically, it is loam but can have thick strata of sandy loam and loamy sand. Reaction in the B horizon is medium acid to very strongly acid. The C horizon commonly is stratified and ranges from slightly clay loam to coarse sand.

Sogn series

The Sogn series consists of somewhat excessively drained, moderately permeable soils on convex ridges and side slopes. These soils are in uplands and on high, bench-shaped areas. They formed in less than 20 inches of loamy material over limestone bedrock. Slope from 5 to 14 percent.

These soils are in a more moist climate and have different vegetation than is defined as the range for the Sogn series, but the differences do not alter the usefulness and behavior of these soils.

Sogn soils are similar to Nordness soils and are commonly adjacent to Bertram, Ripon, Rockton, and Tama soils. The Nordness soils have an A2 horizon and have a thinner A1 horizon than the Sogn soils. The Bertram soils have a more sandy texture than the Sogn soils. The Ripon soils have a silty texture. The Bertram, Ripon, and Rockton soils are underlain by limestone at 20 to 40 inches. The Tama soils have formed in loess and do not have limestone bedrock within a depth of 60 inches.

Typical pedon of Sogn loam, 5 to 14 percent slopes, in a meadow on a north-facing, convex side slope; 2,500 feet north and 940 feet west of the southwest corner of sec. 33, T. 83 N., R. 5 E.

A11—0 to 11 inches; very dark brown (10YR 2/2) loam; weak fine granular structure; friable; mildly alkaline. slight effervescense; clear smooth boundary.

A12—11 to 13 inches; very dark grayish brown (10YR 3/2) loam; weak fine granular structure; friable; mildly alkaline; slight effervescense; abrupt smooth boundary.

R—13 inches; level-bedded indurated limestone that is fractured; loamy material in fractures.

The thickness of the solum and the depth to limestone is from 4 to 20 inches. The A1 horizon is very dark brown (10YR 2/2), very dark gray (10YR 3/1), or very dark grayish brown (10YR 3/2). It is 5 to 15 inches thick. An A3 horizon is present in some profiles and is very dark grayish brown (10YR 3/2) or dark brown (10YR 3/3). The A horizon ranges from loam or silt loam that is high in content of sand to sandy loam or clay loam. In some places there is from 1 to 4 inches of clay or silty material just above the limestone. Reaction in the A horizon ranges from neutral to mildly alkaline.

Sparta series

The Sparta series consists of excessively drained, rapidly permeable soils on benches and in uplands. These soils formed in sands that have been deposited dominantly by wind. Slope ranges from 2 to 18 percent.

Sparta soils are similar to Chelsea and Finchford soils and are commonly adjacent to Dickinson, Udolpho, and Saude soils in the landscape. Chelsea soils have a thinner and lighter colored A horizon than the Sparta soils. The Finchford soils have considerable amounts of coarse sand. The Dickinson soils have finer textures than the Sparta soils. Both Udolpho and Saude soils are loam over sand and gravel, which is at a depth 2 feet.

Typical pedon of Sparta loamy fine sand, 2 to 5 percent slopes, in a pasture on a southwest-facing, convex slope; 955 feet west and 1,142 feet south of the northeast corner of sec 32, T. 83 N., R. 1 E.

A1—0 to 10 inches; very dark grayish brown (10YR 3/2) loamy fine sand; very weak medium subangular blocky structure; very friable; slightly acid; gradual smooth boundary.

A3—10 to 19 inches; very dark grayish brown (10YR 3/2) loamy fine sand; very weak coarse subangular blocky structure; very friable; slightly acid; gradual smooth boundary.

B2—19 to 32 inches; dark yellowish brown (10YR 4/4) loamy fine sand; weak medium subangular blocky structure; very friable; slightly acid; gradual smooth boundary.

C—32 to 60 inches; yellowish brown (10YR 5/6) fine and medium sand; single grained; loose; at a depth of 56 inches, 1-inch band of strong brown (7.5YR 5/6) sandy loam; medium acid.

The solum ranges from 24 to 40 inches in thickness. The A horizon is 10 to 24 inches thick. It has hue of 10YR or 7.5YR; value of 2, 3, or 4; and chroma of 1, 2, or 3. It is loamy fine sand, loamy sand, or fine sand. The B horizon has hue of 10YR or 7.5YR; value of 4, 5, or 6; and chroma of 4, 5, or 6. The B horizon is loamy fine sand, loamy sand, fine sand, or sand. Reaction in the B horizon of this soil ranges from slightly acid to strongly acid. The control section is dominantly fine sand throughout; it is 20 percent or less coarse and very coarse sand. The C horizon is hue of 10YR or 7.5YR; value of 4, 5, or 6; and chroma of 3, 4, 5, or 6. The C horizon usually contains one or more iron bands 1/4 inch to 2 inches thick.

Tama series

The Tama series consists of well drained, moderately permeable soils on ridges and side slopes in uplands and on loess-covered benches along streams. They formed in loess that is more than 40 inches thick. Slope ranges from 0 to 14 percent.

The 120C2 and the 120D2 map units are taxadjuncts to the Tama series because they do not have a mollic epipedon. This difference does not alter the usefulness or behavior of these soils.

Tama soils are similar to Downs soils and are commonly adjacent to Downs, Colo, and Ely soils. Downs soils have a thinner A1 horizon than Tama soils. Colo soils are poorly drained. Ely soils are somewhat poorly drained. Both Colo and Ely soils are grayer than the Tama soils. They are below Tama soils and near the waterways. They have a thicker A horizon.

Typical pedon of Tama silt loam, 2 to 5 percent slopes, in a hay field on a west-facing, convex slope, in uplands; 130 feet west and 880 feet north of the southeast corner of sec. 35, T. 82 N., R. 5 E.

Ap—0 to 8 inches; very dark brown (10YR 2/2) silt loam; weak fine granular structure; friable; neutral; abrupt smooth boundary.

A12—8 to 14 inches; very dark grayish brown (10YR 3/2) light silty clay loam; weak fine and very fine granular structure; friable; slightly acid; clear smooth boundary.

A3—14 to 19 inches; very dark grayish brown (10YR 3/2) light silty clay loam; weak fine and medium subangular blocky structure; friable; medium acid; clear smooth boundary.

B21—19 to 27 inches; brown (10YR 4/3) light silty clay loam that has few fine dark grayish brown (10YR 3/2) coatings on faces of peds; weak fine and medium subangular blocky structure; friable; medium acid; clear smooth boundary.

B22t—27 to 34 inches; brown (10YR 4/3) light silty clay loam; weak medium and fine subangular blocky structure; few thin discontinuous clay films; few discontinuous silt coatings on faces of peds; friable; medium acid; clear smooth boundary.

B23t—34 to 44 inches; brown (10YR 4/3) silty clay loam; few fine distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to weak medium and fine subangular blocky; friable; few thin discontinuous clay films; few discontinuous silt coatings on faces of peds; medium acid; clear smooth boundary.

C—44 to 60 inches; dark yellowish brown (10YR 4/4) light silty clay loam; few fine faint grayish brown (10YR 5/2) and light brownish gray (10YR 6/2) mottles; massive; friable; slightly acid.

The A1 or Ap horizon is black (10YR 2/1) to very dark brown (10YR 2/2) or very dark grayish brown (10YR 3/2). The A horizon is silt loam or silty clay loam that is 10 to 20 inches, unless it is eroded. The B horizon typically has hue of 10YR; value of 3 to 5; and chroma of 3 to 6. The B2t horizon is silty clay loam that has clay content of 28 to 34 percent. Grayish mottles are at a depth of 30 to 50 inches. Reaction in the B horizon is medium acid to strongly acid.

Tell series

The Tell series consists of well drained soils on benches along streams and in uplands. These soils formed in 24 to 40 inches of silty material and in the underlying sandy material. They are moderately permeable in the silty material and rapidly permeable in the sandy material. Slope ranges from 0 to 9 percent.

The Tell soils are similar to Waukegan and Whittier soils and are commonly adjacent to Atterberry soils, sandy substratum. The Atterberry soils, sandy substratum, are somewhat poorly drained and have a grayer B horizon than the Tell soils. They are underlain by sand, which is at a depth of 40 to 60 inches. Unlike the Tell soils, the Waukegan soils do not have an A2 horizon. The Waukegan and Whittier soils have a thicker A1 horizon than the Tell soils.

Typical pedon of Tell silt loam, 2 to 5 percent slopes, in a timbered area on a northwest-facing, convex, low slope, in uplands; 150 feet west and 1,780 feet south of the northeast corner of sec. 29, T. 81 N., R. 4 E.

A1—0 to 4 inches; very dark gray (10YR 3/1) silt loam; moderate medium granular structure; friable; neutral; abrupt wavy boundary.

A2—4 to 11 inches; grayish brown (10YR 5/2) silt loam; weak thin platy structure; friable; very dark gray (10YR 3/1) coatings on peds; medium acid; clear smooth boundary.

B1—11 to 19 inches; brown (10YR 4/3) light silty clay loam; weak fine subangular and angular blocky structure; friable; medium acid; clear smooth boundary.

B2t—19 to 30 inches; yellowish brown (10YR 5/4) silty clay loam; moderate fine angular blocky structure; friable; nearly continuous light gray (10YR 7/2) dry coatings on faces of peds; thin discontinuous clay films; medium acid; abrupt wavy boundary.

B3—30 to 39 inches; brown (7.5YR 5/4) loam; weak medium subangular blocky structure; very friable; medium acid; gradual smooth boundary.

IIC—39 to 60 inches; strong brown (7.5YR 5/6) loamy sand; massive; some vertical cleavage; loose; medium acid.

The solum ranges from about 24 to 45 inches in thickness. Sandy material or contrasting textures are at a depth of 24 to 40 inches; Thickness of the solum and depth to loamy sand or sand might or might not correspond. The Ap horizon is dark grayish brown (10YR 4/2) or brown (10YR 4/3). If present, the A2 horizon is dark grayish brown (10YR 4/2) to brown (10YR 5/3). In eroded areas it can be wholly incorporated in the Ap horizon. The B2t horizon has hue of 10YR, value of 4 or 5, and chroma or 3 to 6. The B2t horizon is silt loam to silty clay loam. The B3 horizon is similar in color but has texture of loam, sandy loam, sandy clay loam, or loamy sand. Reaction in the B horizon ranges from medium

acid to very strongly acid. The IIC horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 8.

Thorp series

The Thorp series consists of poorly drained, slowly permeable soils in depressional areas on uplands and on loess-covered benches along streams. These soils formed in 40 to 50 inches of loess and in the underlying loamy and sandy material. Slope ranges from 0 to 2 percent.

Thorp soils are similar to Walford soils and are commonly adjacent to Atterberry, Garwin, and Tama soils, sandy substratum. The Atterberry soils, sandy substratum, are somewhat poorly drained and have a browner B horizon than the Thorp soils. The Garwin soils, sandy substratum, have a thicker A1 horizon than the Thorp soils but do not have an A2 horizon. The Tama soils, sandy substratum, are well drained and have a brown B horizon. The Walford soils formed in loess that is more than 5 feet deep.

Typical pedon of Thorp silt loam, 0 to 2 percent slopes, in an idle depression; 1,580 feet south and 460 feet east of northest corner of sec 36, T. 81 N., R. 5 E.

Ap—0 to 10 inches; black (10YR 2/1) silt loam; very weak fine granular structure; friable; common worm casts; slightly acid; clear wavy boundary.

A21—10 to 17 inches; dark gray (10YR 4/1) silt loam; few fine faint brown (10YR 4/3) mottles; moderate thin platy structure; friable; thick continuous light gray (10YR 7/1) dry coatings on faces of peds; many fine dark oxides; medium acid; clear wavy boundary.

A22—17 to 22 inches; dark gray (10YR 4/1) and grayish brown (10YR 5/2) silt loam; few fine faint brown (10YR 4/3) mottles; weak thin platy structure; friable; at a depth of 20 to 22 inches, dark reddish brown (5YR 3/2) and yellowish red (5YR 4/6) concretions less than 2mm in size; medium acid; clear wavy boundary.

B21—22 to 25 inches; grayish brown (10YR 5/2) light silty clay loam that has very dark gray (10YR 3/1) coatings on peds; moderate medium subangular blocky structure; friable; thin discontinuous light gray (10YR 7/1) dry coatings on faces of peds; medium acid; gradual wavy boundary.

B22t—25 to 35 inches; olive gray (5Y 5/2) silty clay loam; few fine faint yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; friable; very dark gray (10YR 3/1) clay flows on faces of peds; medium acid; gradual smooth boundary.

B23t—35 to 41 inches; olive gray (5Y 5/2) silty clay loam; few fine faint yellowish brown (10YR 5/6) mottles; moderate fine and medium subangular blocky structure; friable; very dark gray (10YR 3/1) and dark gray (10YR 4/1) clay flows on faces of peds; medium acid; gradual smooth boundary.

B31—41 to 46 inches; grayish brown (2.5Y 5/2) silt loam; common fine distinct strong brown (7.5YR 5/8) mottles; weak coarse prismatic structure; medium acid; abrupt wavy boundary.

IIB32—46 to 60 inches; grayish brown (2.5Y 5/2) stratified silt loam and sandy loam (1/2 inch to 2 inches sandy loam strata) common fine distinct strong brown (7.5YR 5/8) mottles; weak coarse subangular blocky structure; very friable; dark organic clay coatings on some peds and sand grains; medium acid.

The solum ranges from 40 to 60 inches in thickness. The thickness of the solum and the depth to the underlying, stratified, sandy erosional sediment might or might not be the same.

The A1 or Ap horizon is black (10YR 2/1) or very dark gray (10YR 3/1). It is 10 to 12 inches thick. The A2 horizon is typically dark gray (10YR 4/1) but also has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2. It is 10 to 16 inches thick. Reaction in the A2 horizon is medium to strongly acid. The B horizon has hue of 10YR, 2.5Y, or 5Y; value of 4 or 5; and chroma of 2. Mottles are present in the B horizon and are usually yellowish brown, brown, strong brown, or olive gray. The B horizon is typically silty clay loam but can range to silt loam in the lower part. The IIB3 horizon is loamy sand, sandy loam, or sand often stratified with silt loam or loam. Coarse sand or gravel-size pebbles are not uncommon.

Timula series

The Timula series consists of well drained, moderately permeable soils on convex ridges and side slopes. These soils are on pahas and bluffs in uplands. They formed in thick, loess deposits near major streams and rivers. Slope ranges from 12 to 20 percent.

The Timula soils are commonly adjacent to Fayette and Mt. Carroll soils. The Fayette soils have a B horizon of silty clay loam. Unlike the Timula soils, Fayette and Mt. Carroll soils do not have free carbonates within a depth of 4 feet.

Typical pedon of Timula silt loam, 12 to 20 percent slopes, moderately eroded, in a meadow on a southwest-facing, convex back slope, in uplands; 1,110 feet west and 625 feet south of the northeast corner of sec. 20, T. 81 N., R. 6 E.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam intermixed with yellowish brown (10YR 5/4), brown (10YR 5/3) dry; weak medium granular structure; friable; neutral; abrupt smooth boundary.

B1—8 to 17 inches; yellowish brown (10YR 5/4) silt loam; weak medium and fine subangular blocky structure; friable; discontinuous dark grayish brown (10YR 4/2) coatings on faces of peds and in root channels; neutral; gradual smooth boundary.

B2—17 to 26 inches; yellowish brown (10YR 5/4) silt loam; weak medium subangular blocky structure; friable; few fine dark krotovina; mildly alkaline; gradual smooth boundary.
C1—26 to 39 inches; yellowish brown (10YR 5/4) silt loam; weak coarse prismatic structure; friable; few fine strong brown (7.5YR 5/6) oxides; few fine calcium concretions; violent effervescence; moderately alkaline; gradual smooth boundary.
C2—39 to 60 inches; yellowish brown (10YR 5/4) silt loam; massive; vertical cleavage; friable; few fine calcium concretions; violent effervescence; moderately alkaline.

The solum is 20 to 30 inches thick but ranges to 36 inches in thickness. The Ap horizon is 6 to 8 inches thick. It has hue of 10YR; value of 3, 4, or 5; and chroma of 2, 3, or 5. The A2 horizon is typically incorporated into the Ap horizon. The B horizon has hue of 10YR; value of 4, 5, or 6; and chroma of 4, 5, or 6. Reaction in the B horizon is neutral to moderately alkaline. The C horizon is silt or silt loam.

Udolpho series

The Udolpho series consists of somewhat poorly drained soils that are moderately permeable in the upper part and rapidly permeable in the lower part. These soils are on benches along streams and in upland drainageways that do not have well defined outlets. These soils formed in 24 to 40 inches of loamy, alluvial deposits and in the underlying, loamy sand and gravel. They are moderately permeable in the loamy material and rapidly permeable in the underlying sand and gravel. Slope ranges from 0 to 2 percent.

The Udolpho soils are similar to Lawler soils and are commonly adjacent to Lawler, Marshan, Saude, and Wapsie soils. Unlike the Udolpho soils, the Lawler soils do not have an A2 horizon. The Marshan soils have a grayer B horizon than the Udolpho soils and are poorly drained. The Saude and Wapsie soils are browner in the B horizon than the Udolpho soils and are well drained.

Typical pedon of Udolpho loam, 24 to 32 inches to sand and gravel, 0 to 2 percent slopes, in a cultivated field on a north- to northeast-facing, concave slope, on a high terrace along a stream; 570 feet west and 75 feet north of the southeast corner of sec. 30, T. 81 N., R. 4 E.

Ap—0 to 9 inches; very dark gray (10YR 3/1) loam; weak fine and medium subangular blocky structure; friable; neutral; abrupt smooth boundary.
A2—9 to 15 inches; grayish brown (10YR 5/2) light loam; few fine faint yellowish brown (10YR 5/6) mottles; weak thin and medium platy structure; friable; thin discontinuous light gray (10YR 7/2) dry silt coatings; medium acid; clear smooth boundary.
B21—15 to 26 inches; grayish brown (10YR 5/2) loam; common fine faint yellowish brown (10YR 5/6) mottles; moderate fine and medium subangular blocky structure; friable; thin discontinuous light gray (10YR 7/2) dry silt coatings; medium acid; clear smooth boundary.
B22—26 to 30 inches; grayish brown (2.5Y 5/2) sandy loam; few fine faint yellowish brown (10YR I5/6) mottles; weak medium subangular blocky structure; friable; medium acid; clear wavy boundary.
IIB3—30 to 38 inches; grayish brown (10YR 5/2) loamy sand; few fine and medium faint yellowish brown (10YR 5/6) mottles; very weak medium subangular blocky structure; loose; 5 to 7 percent fine gravel; medium acid; gradual wavy boundary.
IIC—38 to 60 inches; yellowish brown (10YR 5/4) sand; few medium and fine faint light brownish gray (10YR 6/2) mottles; single grained; loose; at a depth of 57 inches, deoxidized 3-inch band; slightly acid.

The thickness of the solum and depth to the IIC horizon ranges from about 24 to 40 inches. The A1 or Ap horizon is black (10YR 2/1), very dark gray (10YR 3/1), or very dark grayish brown (10YR 3/2). It is 6 to 10 inches thick. The A2 horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. It is 3 to 6 inches thick. The B horizon has hue of 10YR or 2.5Y, value of 3 through 5, and chroma of 2 or 3. When the B horizon has chroma of 3, mottles have a lower chroma. Texture of the B horizon in the alluvial deposits is typically loam; silt loam that has a high content of sand; clay loam; or sandy clay loam. In some places the lower part is sandy loam. The underlying sand and gravel has hue of 10YR or 2.5Y, value of 4 to 6, chroma of 2 to 6. The IIB3 horizon is dominantly loamy sand, coarse sand, or sand and some gravel. Reaction in the B horizon is medium acid to strongly acid.

Vesser series

The Vesser series consists of poorly drained, moderately permeable soils on bottom lands, foot slopes, and alluvial fans. These soils formed in silty alluvium. Slope ranges from 0 to 2 percent.

The Vesser soils are adjacent to Chaseburg and Zook soils. The Chaseburg soils are stratified and silty to a depth of 60 inches or more. The Zook soils do not have the A2 horizon that the Vesser soils do, but they have a heavier textured B horizon.

Typical pedon of Vesser silt loam, 0 to 2 percent slopes, in a cultivated field on a west-facing, alluvial fan; 1,070 feet east and 1,150 feet north of the southwest corner of sec. 16, T. 83 N., R. 5 E.

Ap—0 to 10 inches; very dark gray (10YR 3/1) silt loam, grayish brown (10YR 5/2) dry; weak fine granular structure; friable; neutral; abrupt smooth boundary.
A12—10 to 16 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; weak fine subangular blocky structure parting to weak fine granular; friable; slightly acid; clear smooth boundary.

A21—16 to 23 inches; dark grayish brown (10YR 4/2) and grayish brown (10YR 5/2) silt loam, light brownish gray (10YR 6/2) dry; weak medium and coarse platy structure; friable; slightly acid; gradual smooth boundary.

A22—23 to 32 inches; grayish brown (10YR 5/2) silt loam, light gray (10YR 7/1) dry; few fine distinct brown (7.5YR 4/2) mottles; weak coarse and very coarse platy structure; friable; medium acid; clear smooth boundary.

B21t—32 to 42 inches; dark gray (10YR 4/1) light silty clay loam, common gray (10YR 5/1) coatings on faces of peds; common fine distinct brown (7.5YR 4/2) mottles; moderate medium and fine subangular blocky structure; friable; few thin discontinuous black (10YR 2/1) clay films; common fine black oxides; medium acid; gradual smooth boundary.

B22t—42 to 50 inches; dark gray (10YR 4/1) silty clay loam, common gray (10YR 5/1) coatings on peds; moderate medium prismatic structure parting to moderate fine subangular blocky; firm; common fine distinct brown (7.5YR 4/2 and 7.5YR 4/4) mottles; common thick discontinuous black (10YR 2/1) clay films; medium acid; gradual smooth boundary.

B23t—50 to 60 inches; dark gray (10YR 4/1) silty clay loam; common fine distinct brown (7.5YR 4/4) mottles; moderate medium prismatic structure; firm; common thin discontinuous black (10YR 2/1) clay films; medium acid.

The A1 horizon is black (10YR 2/1) to very dark grayish brown (10YR 3/2). It is 10 to 16 inches thick. The A2 horizon is very dark gray (10YR 3/1) to grayish brown (10YR 5/2). It is commonly 16 to 20 inches thick but is as thin as 14 inches and as thick as 22 inches. The B horizon is generally very dark gray (10YR 3/1) or dark gray (10YR 4/1). The B horizon has grayer coatings on peds than those of the matrix. The B horizon typically is at a depth of about 30 inches but ranges from 26 to 36 inches. The B horizon is typically a silty clay loam and ranges in clay content from 30 to 36 percent. Reaction in the B horizon ranges slightly acid to medium acid.

Walford series

The Walford series consists of poorly drained, slowly permeable soils on flat or in depressional areas in uplands and on loess-covered benches along streams. These soils formed in more than 40 inches of loess. Slope ranges from 0 to 1 percent.

The Walford soils are similar to Thorp soils and are commonly adjacent to Atterberry and Tama soils. The Atterberry soils are somewhat poorly drained and have a browner B horizon than the Walford soils. The Tama soils are well drained and have a brown B horizon. They do not have an A2 horizon. The Thorp soils are underlain by sand at a depth of 4 feet.

Typical pedon of Walford silt loam, 0 to 1 percent slopes, in a cultivated field on a north-facing slope, in a swale at the beginning of a drainageway, in uplands; 610 feet east and 668 feet north of the southwest corner of sec. 32, T. 82 N., R. 6 E.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silt loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure; friable; medium acid; abrupt smooth boundary.

A2—9 to 19 inches; grayish brown (10YR 5/2) silt loam, light brownish gray (10YR 6/2) dry; few fine faint (10YR 5/6) mottles; weak medium and thin platy structure; friable; medium acid; clear smooth boundary.

B21t—19 to 26 inches; grayish brown (10YR 5/2) light silty clay loam; few fine faint light olive brown (2.5Y 5/4) mottles; moderate fine subangular blocky structure; friable; few thin discontinuous clay films; strongly acid; gradual smooth boundary.

B22t—26 to 30 inches; grayish brown (10YR 5/2) silty clay loam; common fine distinct yellowish brown (10YR 5/6) mottles; moderate medium and fine subangular and angular blocky structure; friable; thin continuous gray (10YR 5/1) clay films; strongly acid; gradual smooth boundary.

B23t—30 to 38 inches; grayish brown (10YR 5/2) silty clay loam; common fine distinct strong brown (7.5YR 5/6) mottles; moderate medium angular blocky structure; friable; thin continuous gray (10YR 5/1) clay films; strongly acid; gradual smooth boundary.

B31t—38 to 47 inches; grayish brown (2.5Y 5/2) light silty clay loam; few fine distinct brown (7.5YR 4/4) and strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; friable; gray (10YR 5/1) coatings on root channels; thin discontinuous gray (10YR 5/1) clay films; at a depth of 40 inches, yellowish red (5YR 4/6) iron stains; medium acid; gradual smooth boundary.

B32—47 to 54 inches; light olive gray (5Y 6/2) light silty clay loam; few fine distinct strong brown (7.5YR 5/6) mottles; massive; some vertical cleavage; friable; very dark gray (10YR 3/1) coatings on root channels; few thin discontinuous clay films; medium acid; diffuse smooth boundary.

C—54 to 60 inches; light olive gray (5Y 6/2) silt loam; few fine faint yellowish brown (10YR 5/6) mottles; massive; friable; dark gray (10YR 4/1) coatings on root channels; common fine distinct yellowish red (5YR 5/6) iron stains; slightly acid.

The solum ranges from 50 to 70 inches in thickness. The A1 or Ap horizon is very dark gray (10YR 3/1) or very dark grayish brown (10YR 3/2). It is 6 to 10 inches thick. The A2 horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2. It is 8 to 12 inches thick. The B2t horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2. Mottles have a higher chroma. The Bt horizon is silty clay loam. The clay content

ranges from 32 to 36 percent with a weighted average of clay that is less than 35 percent. Reaction in the B horizon is from medium acid to strongly acid.

Wapsie series

The Wapsie series consists of well drained soils on benches along streams and on bottom lands. These soils formed in 20 to 32 inches of loamy material and in the underlying coarse sand and gravel. They are moderately permeable in the loamy material and very rapidly permeable in the underlying sand and gravel. Slope ranges from 2 to 9 percent.

Wapsie soils are similar to Saude soils and the Wapsie Variant and are commonly adjacent to Udolpho, Shaffton, and Waukee soils. The Saude soils have a thicker A horizon than the Wapsie soils. The Wapsie Variant is on flood plains and is stratified. The Waukee soils are underlain by sand and gravel at a depth of 32 to 40 inches. The Udolpho and Shaffton soils have a grayer B horizon than the Wapsie soils and are somewhat poorly drained.

Typical pedon of Wapsie loam, 2 to 5 percent slopes, in a cultivated field on a convex-sloping high terrace; 880 feet north and 2,080 feet east of the southwest corner of sec. 29, T. 81 N., R. 4 E.

Ap—0 to 6 inches; very dark grayish brown (10YR 3/2) loam; weak fine granular structure; friable; neutral; abrupt smooth boundary.

A2—6 to 11 inches; dark grayish brown (10YR 4/2) loam that has very dark grayish brown (10YR 3/2) coatings on peds; weak medium platy structure; friable; neutral; clear smooth boundary.

B21—11 to 18 inches; brown (10YR 4/3) loam; weak fine subangular blocky structure; friable; medium acid; clear wavy boundary.

B22t—18 to 25 inches; brown (7.5YR 4/4) sandy clay loam; moderate fine and medium angular blocky structure; friable; thin discontinuous clay films; medium acid; clear wavy boundary.

IIB3—25 to 29 inches; brown (7.5YR 4/4) sandy clay loam; weak fine and medium subangular blocky structure; friable; 10 percent pebbles; medium acid; abrupt wavy boundary.

IIC1—29 to 39 inches; dark yellowish brown (10YR 4/4) sand; single grained; loose; 10 to 15 percent pebbles; 7 percent clay; medium acid; gradual wavy boundary.

IIC2—39 to 60 inches; yellowish brown (10YR 5/4) sand; single grained; loose; 2 percent gravel; medium acid.

The solum typically ranges from 24 to 40 inches in thickness. Loamy sand or sand ranges in depth from 24 to 32 inches. The thickness of the solum and the depth to contrasting textures might or might not be the same.

The A1 or Ap horizon is very dark brown (10YR 2/2), very dark gray (10YR 3/1), or very dark grayish brown (10YR 3/2). It is 6 to 10 inches thick. The A2 horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The A2 horizon can be wholly incorporated into the Ap horizon in some eroded and cultivated areas. The A horizon is loam or silt loam that has a high content of sand. The B2 horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 8. The B horizon is loam or sandy clay loam that can grade to sandy loam or loamy sand in the lower part. Clay content in the B horizon ranges from about 18 to 25 percent. Reaction in the B horizon is medium acid to strongly acid. The IIC horizon has hue of 10YR or 7.5YR; value of 4, 5 or 6; and chroma of 4 to 8. The IIC horizon is loamy sand or sand that has some gravel in places.

Wapsie Variant

The Wapsie Variant consists of well drained soils on low benches within the flood plain of the Wapsipinicon River. These soils are flooded for brief periods. They formed in stratified, loamy alluvium over sand. They are moderately permeable in the loamy alluvium and rapidly permeable in the underlying sand. Slope ranges from 0 to 2 percent.

The Wapsie Variant is similar to Wapsie soils and is commonly adjacent to Ambraw and Shaffton soils. The Wapsie soils are not stratified. The Ambraw and Shaffton soils have a grayer B horizon and are poorly drained.

Typical pedon of Wapsie Variant loam, 0 to 2 percent slopes, in a cultivated field on a low bench along a stream; 1,560 feet west and 2,440 feet north of the southeast corner of sec. 26, T. 82 N., R. 1 E.

Ap—0 to 6 inches; very dark grayish brown (10YR 3/2) loam; weak fine granular structure; friable; medium acid; clear smooth boundary.

A2—6 to 9 inches; dark brown (10YR 3/3) loam; weak medium platy structure; friable; strongly acid; clear smooth boundary.

B2—9 to 15 inches; brown (10YR 4/3) loam; weak coarse subangular blocky structure parting to weak medium subangular blocky; friable; some clay bridging between sand grains; strongly acid; clear smooth boundary.

B3—15 to 21 inches; brown (7.5YR 4/4) sandy loam; very weak coarse subangular blocky structure; friable; medium acid; clear smooth boundary.

C1—21 to 27 inches; yellowish brown (10YR 5/6) loamy sand; single grained; very friable; few iron stains; neutral; clear smooth boundary.

C2—27 to 39 inches; yellowish brown (10YR 5/4) sand; single grained; loose; neutral; clear smooth boundary.

C3—39 to 54 inches; stratified brown (7.5YR 4/4) and very pale brown (10YR 7/4) sand; single grained; loose; few fine dark oxides; neutral; clear smooth boundary.

C4—54 to 62 inches; stratified light yellowish brown (10YR 6/4) and brownish yellow (10YR 6/6) sand; single grained; loose; neutral.

The solum typically is 20 to 36 inches thick but can be as shallow as 10 inches thick in some areas.

The Ap horizon is very dark brown (10YR 2/2), very dark gray (10YR 3/1), or very dark grayish brown (10YR 3/2). It is 6 to 10 inches thick. The A2 horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. It is 3 or 4 inches thick. In some areas cultivation can incorporate the whole A2 horizon into the Ap horizon. The A horizon is loam or silt loam that has a content of sand. The B horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. The B horizon is typically loam but grades to sandy loam or loamy sand in the lower part. Reaction in the B horizon is medium acid to strongly acid. The C horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3 to 6.

Waukee series

The Waukee series consists of well drained soils on benches along streams and on outwash plains in uplands. These soils formed in 32 to 40 inches of loamy material and in the underlying coarse sand and gravel. They have moderate permeability in the loamy material and very rapid permeability in the underlying sand and gravel. Slope ranges from 0 to 5 percent.

The Waukee soils are commonly adjacent to Dickinson, Lawler, Marshan, and Saude soils. The Dickinson soils have a higher sand content throughout than the Waukee soils. The Lawler soils are somewhat poorly drained, and the Marshan soils are poorly drained. The Lawler and Marshan soils have a grayer B horizon than the Waukee soils. The Saude soils are underlain by sand and gravel at a depth of 24 to 32 inches.

Typical pedon of Waukee loam, 0 to 2 percent slopes, in a cultivated field on a north- to northeast-facing, convex terrace along a stream; 2,532 feet east and 2,320 feet north of the southwest corner of sec. 10, T. 80 N., R. 5 E.

Ap—0 to 9 inches; very dark brown (10YR 2/2) loam, low in content of sand; moderate fine granular structure; friable; slightly acid; abrupt smooth boundary.

A12—9 to 15 inches; very dark grayish brown (10YR 3/2) loam, low in content of sand; weak fine subangular blocky structure parting to moderate fine granular; friable; slightly acid; clear smooth boundary.

A3—15 to 19 inches; dark brown (10YR 3/3) loam that has very dark grayish brown (10YR 3/2) coatings on faces of peds; weak medium subangular blocky structure parting to weak fine granular; friable; few fine very dark gray (10YR 3/1) worm casts; medium acid; clear smooth boundary.

B1—19 to 27 inches; brown; (10YR 4/3) loam that has dark brown (10YR 3/3) coatings on faces of peds; moderate fine and medium subangular blocky structure; friable; medium acid; clear smooth boundary.

B21—27 to 32 inches; dark yellowish brown (10YR 4/4) loam; moderate coarse and medium subangular blocky structure; friable; few fine very dark gray (10YR 3/1) worm casts; medium acid; gradual smooth boundary.

B22—32 to 37 inches; dark yellowish brown (10YR 4/4) loam; weak coarse subangular blocky structure; friable; few fine very dark gray (10YR 3/1) coatings in root channels; medium acid; abrupt smooth boundary.

IIB3—37 to 40 inches; dark yellowish brown (10YR 4/4) loamy coarse sand; weak coarse subangular blocky structure; friable; common fine gravel, slightly acid; clear smooth boundary.

IIC—40 to 60 inches; yellowish brown (10YR 5/4) gravelly sand; single grained; very friable to loose; slightly acid.

The thickness of the solum might or might not be the same as the depth to coarse loamy sand or gravelly sand. Depth to the sandy and gravelly material is typically 32 to 40 inches.

The A1 or Ap horizon is black (10YR 2/1), very dark brown (10YR 2/2), or very dark grayish brown (10YR 3/2). It is loam or silt loam that has a high content of sand. The A horizon is 13 to 23 inches thick. The B2 horizon has hue of 10YR, value of 4 or 5, and chroma of 3 to 6. The B2 horizon is loam, sandy clay loam, or sandy loam and ranges in clay content from about 18 to 26 percent. In some pedons there is a B3 horizon of sandy loam or loamy sand. Reaction in the B horizon is slightly acid to strongly acid. The IIC horizon is coarse loamy sand, gravelly sand, or sand. Gravel content is about 10 to 20 percent.

Waukegan series

The Waukegan series consists of well drained soils on benches along streams and in uplands. These soils formed in 24 to 40 inches of silty material and in the underlying sandy material. They have moderate permeability in the silty material and very rapid permeability in the underlying sandy material. Slope ranges from 0 to 9 percent.

The Waukegan soils are similar to Tell and Whittier soils and are commonly adjacent to Dinsdale soils and Muscatine and Tama soils, sandy substratum. The Tell and Whittier soils formed under trees and have an A2 horizon. The Dinsdale soils are underlain by glacial till at a depth of 24 to 40 inches. The Muscatine soils, sandy substratum, have a grayer B horizon than the Waukegan soils and are somewhat poorly drained. Both the Muscatine and Tama soils, sandy substratum, are underlain by sand at a depth of 40 to 60 inches.

Typical pedon of Waukegan silt loam, 2 to 5 percent slopes, in a cultivated field on a southwest-facing side of a ridgetop, in uplands; 1,671 feet east and 1,980 feet north of the southwest corner of sec. 13, T. 31 N., R. 5 E.

Ap—0 to 8 inches; black (10YR 2/1) silt loam; weak fine subangular blocky structure; friable; neutral; abrupt smooth boundary.

A3—8 to 15 inches; very dark grayish brown (10YR 3/2) silt loam; weak fine subangular blocky structure; friable; neutral; clear wavy boundary.

B21—15 to 22 inches; brown (10YR 4/3) heavy silt loam; weak fine and very fine subangular blocky; friable; dark grayish brown (10YR 4/2) coatings on faces of peds; neutral; clear wavy boundary.

B22—22 to 28 inches; dark yellowish brown (10YR 4/4) light silty clay loam; weak fine and very fine subangular blocky structure; friable; medium acid; clear wavy boundary.

B23—28 to 35 inches; yellowish brown (10YR 5/4) light silty clay loam; weak fine and medium subangular blocky structure; friable; medium acid; clear wavy boundary.

IIB3—35 to 39 inches; yellowish brown (10YR 5/4) sandy loam; weak medium subangular blocky structure; very friable; medium acid; clear wavy boundary.

IIC—39 to 60 inches; yellowish brown (10YR 5/4) loamy sand; single grained; loose; brown (7.5YR 4/4) sandy loam strata at a depth of 41 and 51 inches; medium acid.

The thickness of the solum ranges from 35 inches to about 60 inches, and depth to contrasting textures ranges from about 30 to 40 inches but can be as shallow as 24 inches.

The A1 horizon is typically black (10YR 2/1) or very dark brown (10YR 2/2), and the A3 horizon is very dark brown (10YR 2/2) or very dark grayish brown (10YR 3/2). The A horizon is 10 to 17 inches thick. The B2 horizon has hue of 10YR, value of 4 through 6, and chroma of 3 through 6. Reaction in the B22 hroizon ranges from medium acid to strongly acid. The B horizon is typically silty clay loam but ranges to silt loam. The IIC horizon is stratified loamy sand and sand.

Whittier series

The Whittier series consists of well drained soils on benches along streams and in uplands. These soils formed in 30 to 40 inches of silty material and in the underlying sandy material. They are moderately permeable in the silty material and rapidly permeable in the underlying sandy material. Slope ranges from 2 to 5 percent.

The Whittier soils are similar to Tell and Waukegan soils and are commonly adjacent to Atterberry soils, sandy substratum. The Atterberry soils, sandy subsratum, are somewhat poorly drained and have a grayer B horizon than the Whittier soils. They are underlain by sand at a depth of 40 to 60 inches. The Tell soils have a thinner A1 horizon. The Waukegan soils have a thicker A horizon than the Whittier soils have, but they do not have the A2 horizon.

Typical pedon of Whittier silt loam, 2 to 5 percent slopes, in a pasture on an east-facing, convex slope, on terraces; 1,660 feet south and 2,340 feet west of the northeast corner of sec. 1, T. 80 N., R. 2 E.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine granular structure; friable; neutral; clear smooth boundary.

A2—9 to 13 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak thin platy structure; friable; neutral; clear smooth boundary.

B1t—13 to 17 inches; brown (10YR 4/3) heavy silt loam; weak medium and fine subangular structure; friable; dark gray (10YR 4/1) coatings on root channels; neutral; gradual smooth boundary.

B21t—17 to 22 inches; brown (10YR 4/3) and dark yellowish brown (10YR 4/4) light silty clay loam; moderate medium and fine subangular blocky structure; friable; few thin discontinuous dark brown (10YR 3/3) clay films; medium acid; gradual smooth boundary.

B22t—22 to 27 inches; brown (10YR 4/3) silty clay loam that has yellowish brown (10YR 5/4) coatings on faces of peds; moderate fine angular blocky and subangular blocky structure; friable; few fine discontinuous dark yellowish brown (10YR 4/4) clay films; strongly acid; gradual smooth boundary.

B31t—27 to 31 inches; pale brown (10YR 6/7) and brown (10YR 5/3) silt clay loam; few fine faint yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to weak fine angular blocky and subangular blocky; friable; few thin discontinuous dark yellowish brown (10YR 4/4) clay films, strongly acid; abrupt smooth boundary.

IIB32—31 to 36 inches; yellowish brown (10YR 5/4) and light yellowish brown (10YR 6/4) loamy sand; few fine distinct yellowish red (5YR 5/6) mottles; weak medium subangular blocky structure; friable; medium acid; clear smooth boundary.

IIB33—36 to 41 inches; brown (10YR 4/3) loamy sand; weak medium subangular blocky structure; very friable; medium acid; clear smooth boundary.

IIC—41 to 60 inches; stratified yellowish brown (10YR 5/4) dark yellowish brown (10YR 4/4) light yellowish brown (10YR 6/4) and brown (10YR 4/3) fine sand; single grained; loose; medium acid.

The thickness of the solum typically ranges from 30 to 48 inches. Depth to sandy material is typically 30 to 40 inches but can be as shallow as 24 inches. The

thickness of the solum and the depth to the loamy sand or sand might or might not be the same.

The A1 or Ap horizon is very dark gray (10YR 3/1) or very dark grayish brown (10YR 3/2). It is 6 to 9 inches thick. The A2 horizon is dark grayish brown (10YR 4/2) or brown (10YR 4/3). Typically, it is about 2 to 6 inches thick, but in eroded areas it can be wholly incorporated in the plow layer. The B2 horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. Reaction in the B2 horizon ranges from medium acid to strongly acid. The IIC horizon is fine sand or loamy sand.

Zook series

The Zook series consists of poorly drained, slowly permeable soils on bottom lands. These soils formed in silty, alluvial deposits along streams. Slope ranges from 0 to 2 percent.

The Zook soils are similar to Colo soils and are commonly adjacent to Colo and Vesser soils. The Colo soils have a lighter textured A horizon than that of the Zook soils. The Vesser soils have a thinner A1 horizon than that of the Zook soils, and they have an A2 horizon.

Typical pedon of Zook silty clay loam, 0 to 2 percent slopes, in a cultivated field in a slightly depressional area; 2,530 feet west and 830 feet south of the northeast corner of sec. 20, T. 83 N., R. 5 E.

Ap—0 to 9 inches; black (N 2/0) silty clay loam; weak fine granular structure; friable; slightly acid; clear smooth boundary.

A12—9 to 17 inches; black (N 2/0) silty clay loam; moderate fine and medium subangular blocky structure; friable; slightly acid; gradual smooth boundary.

A13—17 to 24 inches; black (N 2/0) heavy silty clay loam; moderate fine and medium subangular blocky structure; friable; slightly acid; clear smooth boundary.

A14—24 to 39 inches; black (N 2/0) heavy silty clay loam; moderate fine and medium subangular blocky structure; firm; slightly acid; gradual smooth boundary.

B2g—39 to 44 inches; black (10YR 2/1) heavy silty clay loam, very dark gray (10YR 3/1) kneaded; few fine distinct olive gray (5Y 5/2) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; slightly acid; clear smooth boundary.

Cg—44 to 60 inches; mottled gray (5Y 5/1), olive gray (5Y 5/2) and dark gray (5Y 4/1) silty clay loam; massive; some vertical cleavage; firm; some fibers in root channels; slightly acid.

The solum is typically 40 inches or more thick but ranges from 36 to 60 inches in thickness. Free carbonates are at a depth of greater than 50 inches.

The A horizon is typically black (10YR 2/1 or N 2/0) but can include very dark gray (10YR 3/1) in the lower part. The A horizon is typically silty clay loam that has clay content ranging from 32 to 38 percent. The B2g horizon is black (10YR 2/1) or very dark gray (10YR 3/1). It is typically a silty clay loam and ranges in clay content from 32 to 38 percent. Reaction in the A and B horizon is slightly acid, but in some pedons it is neutral in the solum.

Zwingle series

The Zwingle series consists of poorly drained, very slowly permeable soils on high benches along streams. These soils formed in reddish, clayey lacustrine sediments along the Mississippi River and its tributaries. Slope ranges from 0 to 5 percent.

These soils contain more clay, are more acid in the upper part of the argillic horizon, and contain less evidence of reddish colors in the solum than is defined as the range of the Zwingle series. These differences do not alter their usefulness and behavior.

The Zwingle soils are commonly adjacent to Chaseburg soils and the Zwingle Variant. The Chaseburg soils formed in stratified, silty alluvium and are on the flood plain. The Zwingle Variant has a grayer B horizon than the Zwingle soils.

Typical pedon of Zwingle silt loam, 0 to 2 percent slopes, in a timbered pasture on a high bench along a stream; 100 feet north and 40 feet east of the southwest corner of sec. 1, T. 80 N., R. 5 E.

A1—0 to 3 inches; very dark gray (10YR 3/1) silt loam, light brownish gray (10YR 6/2) dry; moderate thin platy structure; friable; many fine dark reddish brown (5YR 3/2) oxides; strongly acid; abrupt smooth boundary.

A2—3 to 10 inches; light brownish gray (10YR 6/2) silt loam, white (10YR 8/1) dry; moderate medium and thin platy structure; friable; many fine dark reddish brown (5YR 2/2) oxides; very strongly acid; clear smooth boundary.

B1—10 to 12 inches; yellowish brown (10YR 5/4) silty clay loam that has light brownish gray (10YR 6/2) coatings on faces of peds; moderate medium subangular blocky structure; friable; many fine dark reddish brown (5YR 3/2) and strong brown (7.5YR 5/6) oxides; very strongly acid; abrupt wavy boundary.

B21t—12 to 19 inches; brown (7.5YR 4/2) clay; moderate fine angular blocky structure; firm; thin continuous clay films; very strongly acid; abrupt wavy boundary.

B22t—19 to 29 inches; brown (7.5YR 5/2) clay; moderate fine and medium angular blocky structure; firm; thin nearly continuous clay films; strongly acid; abrupt smooth boundary.

B23t—29 to 34 inches; brown (7.5YR 4/2) clay; moderate fine and medium angular and subangular blocky structure; firm; thin discontinuous clay films;

few fine distinct strong brown (7.5YR 5/6) mottles; medium acid; abrupt smooth boundary.

B24t—34 to 42 inches; grayish brown (2.5Y 5/2) clay; few fine faint grayish brown (10YR 5/2) and many fine distinct yellowish brown (10YR 5/6) mottles; moderate medium angular blocky structure; firm; thin discontinuous clay films; slightly acid; clear smooth boundary.

B3—42 to 58 inches; grayish brown (10YR 5/2) clay; moderate medium prismatic structure parting to weak medium subangular blocky; firm; many fine yellowish brown (10YR 5/6) and common fine reddish brown (5YR 4/4) oxides; slightly acid; abrupt smooth boundary.

C—58 to 60 inches; brown (7.5YR 4/4) silty clay; massive; firm; common thin reddish brown (5YR 4/3) strata; neutral.

The A1 horizon is very dark gray (10YR 3/1), very dark grayish brown (10YR 3/2), or dark grayish brown (10YR 4/2). The A1 horizon is 3 to 6 inches thick. The A2 horizon has hue of 10YR, value of 5 or 6, and chroma of 2 or 3. The A2 horizon is typically 4 to 8 inches thick but can be as thin as 3 inches. The B horizon has hue of 10YR, 7.5YR, or 2.5YR; value of 3, 4, or 5; and chroma of 2, 3, or 4. The B horizon is typically clay but ranges to silty clay. Reaction in the B horizon is slightly acid to extremely acid. The C horizon is silty clay but can be silty clay loam that has strata of clay.

Zwingle Variant

The Zwingle Variant consists of poorly drained, very slowly permeable soils on high benches along streams. These soils formed in clayey lacustrine sediments along the Mississippi River and its tributaries. Slope ranges from 0 to 2 percent.

The Zwingle Variant is commonly adjacent to Zwingle soils. The Zwingle soils have a reddish brown B horizon and surround the Zwingle Variant.

Typical pedon of Zwingle Variant silty clay, 0 to 2 percent slopes, in a permanent pasture on a level, high terrace along a stream; 1,237 feet west and 2,526 feet north of southeast corner of sec. 18, T. 83 N., R. 7 E.

Ap—0 to 7 inches; very dark gray (10YR 3/1) silty clay; moderate fine granular structure; firm; slightly acid; abrupt wavy boundary.

B1—7 to 18 inches; grayish brown (2.5Y 5/2) clay; few fine distinct yellowish brown (10YR 5/6) mottles; moderate fine angular and subangular blocky structure; firm; strongly acid; clear wavy boundary.

B21—18 to 26 inches; grayish brown (2.5Y 5/2) clay; few fine distinct yellowish brown (10YR 5/6) mottles; moderate fine angular and subangular blocky structure; very firm; extremely acid; clear wavy boundary.

B22—26 to 34 inches; grayish brown (10YR 5/2) clay; few fine distinct yellowish brown (10YR 5/6) mottles; moderate fine angular blocky structure; very firm; extremely acid; clear wavy boundary.

B23t—34 to 48 inches; reddish gray (5YR 5/2) and light olive brown (2.5Y 5/4) clay; moderate fine angular blocky structure; very firm; black (10YR 2/1) soft concretions; thin discontinuous grayish brown (10YR 5/2) clay films; very strongly acid; clear smooth boundary.

B3—48 to 60 inches; grayish brown (10YR 5/2) silty clay; weak medium angular blocky structure; very firm; few thin grayish brown (2.5Y 5/2) strata; strongly acid.

The solum ranges from 45 to 60 inches or more in thickness. The A1 or Ap horizon is black (10YR 2/1), very dark gray (10YR 3/1), or very dark grayish brown (10YR 3/2). The A1 or Ap horizon is typically 7 inches thick but ranges from 4 to 10 inches in thickness. The A2 horizon has hue of 10YR or 2.5Y; value of 4 to 6; and chroma of 2. The A2 horizon is usually incorporated into the Ap horizon when it is cultivated. The A horizon is typically silty clay but ranges to silt loam in undisturbed areas. The B2 horizon has hue of 10YR, 7.5YR, or 5YR; value of 4 or 5; and chroma of 2 to 6. The B2 horizon is typically clay or silty clay that ranges in content of clay from 50 to 80 percent. Reaction in the B horizon is strongly acid to extremely acid.

formation of the soils

In this section factors that affect the formation of soils in Clinton County are discussed. The formation that has taken place in the county involved many steps and processes. All are important in the development of soil.

factors of soil formation

Soil is produced by soil-forming processes acting on materials deposited or accumulated by geologic agencies. The characteristics of the soil at any given point are determined by (1) the physical and mineralogical composition of the parent material, (2) the climate under which the soil material has accumulated and existed since accumulation, (3) the plant and animal life on and in the soil, (4) the relief, or lay of the land, and (5) the length of time the forces of soil formation have acted on the soil materials (*5*).

Climate and plant and animal life, chiefly plants, are active factors of soil formation. They act on the parent material that has accumulated through the weathering of rocks and slowly change it to a natural body that has genetically related horizons. The effects of climate and plant and animal life are conditioned by relief. The parent material also affects the kind of soil profile that is formed and, in extreme cases, determines it almost entirely. Finally, time is needed to change the parent material into a soil profile. It may be much or little, but some time is always required for differentiation of soil horizons. A long time generally is required for the development of distinct horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effect of any one factor unless conditions are specified for the other four. Many of the processes of soil formation are unknown.

parent material

The accumulation of parent material is the first step in the formation of a soil. Some thin layers of a few soils in the county formed as the result of weathering of the bedrock. Most of the soils, however, formed in material that was transported from the site of the parent rock and redeposited at a new location through the action of glacial ice, water, wind, and gravity.

The principal parent materials in Clinton County are glacial drift, loess, alluvium, and eolian, or wind-deposited, sand. Much less extensive parent materials are organic deposits and residuum.

Loess, a silty material deposited by wind, covers about 70 percent of Clinton County. It ranges in depth from about 2 to 10 feet and primarily overlies both glacial till and limestone bedrock, but in some areas it is over glacial outwash. In about 50 percent of the latter areas, the loess is greater than 5 feet thick; the remainder is covered by 2 to 5 feet of loess. Loess consists mostly of silt and some clay and is usually calcareous when unweathered. It does not contain coarse sand or gravel because those materials are too large to be moved by wind. It does contain small amounts, however, generally less than 5 percent, of very fine sand.

In Clinton County the Atterberry, Downs, Fayette, Garwin, Muscatine, Mt. Carroll, Timula, Tama, and Walford soils formed in more than 5 feet of loess. The Thorp and sandy substratum phases of Atterberry, Garwin, Muscatine, and Tama soils have formed in 40 to 60 inches of loess and in the underlying sandy material. The Tell, Waukegan, and Whittier soils have also formed in loess and in the underlying sand and gravel, but this material is encountered at 24 to 40 inches. The Ansgar, Dinsdale, Klinger, and Maxfield soils formed in 24 to 40 inches of loess that is underlain by glacial till. Ripon soils, on the other hand, formed in 24 to 40 inches of loess underlain by bedrock.

Glacial drift is all rock material transported by glacial ice, all deposits made by glacial ice, and all deposits of glacial origin in the sea or in bodies of glacial melt water. It includes glacial till. Glacial till is an unsorted sediment that ranges from the size of boulders to the size of particles (*11*). Glacial drift is the most extensive parent material in Clinton County. At least twice during the glacial period, continental ice or glaciers moved over the land. The record of these ice invasions is contained in the unconsolidated rock material that was deposited by the melting ice and meltwater streams. The older ice sheet, known as the Nebraskan, occurred some 750,000 years ago (*6*). It was followed by the Aftonian interglacial period. The Kansan Glaciation is thought to have started about 500,000 years ago.

A more recent glaciation was recognized by Leighton, in 1933 (*7*), as the Iowan Substage of the Wisconsin Glaciation, but recent studies of the presence and identification of Iowan glacial till indicate that the conclusions formed from studies made before 1960 are questionable. Intensive, detailed, geomorphic, stratigraphic work shows that the landscape is a

multilevel sequence of eroded surfaces, and that many of the levels cut into Kansan and Nebraskan till. Ruhe's study (*11*) demonstrated that the Iowan till does not exist, but that an erosion-surface complex does exist in the Iowan region. The Iowan surface is multilevel and is arranged in a series of steps from major drainageways toward bounding divides. The Iowan surface is marked by a stone line where it cuts into Kansan and Nebraskan till. The stone line is on all levels of the stepped surfaces, and it passes under the alluvium along the drainageways.

The soils that formed in the glacial drift and glacial till on the "Iowan Erosion Surface" are the Clyde, Kenyon, Readlyn, and Schley series. The Kenyon and Readlyn soils have loamy, surficial sediments about 2 feet thick over the glacial material. In lower, concave slopes and waterways, the loamy sediments are deeper over the glacial till. The Clyde and Schley soils formed in this terrain. A stone line or pebble band commonly separates the friable, loamy surficial sediments from the firm, loam glacial till (fig. 11).

In Clinton County there are also soils that formed in glacial till in the loess-covered uplands. The process of geologic erosion removed the loess from many, steep side slopes and exposed the glacial till material. The Gara and Lindley soils are examples.

Alluvium consists of sediment that has been removed from its place of origin and deposited by water downstream. Alluvial deposits of Late Wisconsin age are on the flood plains and terraces of water courses in Clinton County. These materials are lenses and layers of sand, gravel, silt, and clay. The thickness of alluvial material is variable. Along major streams these materials are as much as 100 feet thick; along small streams they are less than 5 feet thick. The Udolpho, Waukee, and Saude soils formed in loamy alluvium over sand and gravel, but the Raddle soils formed in silty material over stratified sand. The sand is at a depth of about 4 feet.

Some alluvial material has been transported only a short distance and has accumulated at the foot of the slope on which it originated. This material is called "local" alluvium or colluvium and retains many characteristics of the soils in the areas from which it has been eroded. The Ely soil is an example. It is at the foot of the slopes directly below loess-derived soils.

When streams overflow their channels and water spreads over the flood plains, coarse textured materials are deposited first. As the floodwater continues to spread, it moves more slowly, and fine textured sediments, such as silts, are deposited. After the flood has passed, the finest particles, or clay, settle from the water that is left standing in the lowest part of the flood plain. The Chaseburg soils formed from silty material, and the Ambraw soils formed from coarser textured, loamy material. The Colo, Sawmill, and Zook soils contain more clay because they are on the lowest part of the flood plain. They are silty clay loam.

The unique alluvial deposits in Clinton County are along the Mississippi River and its tributaries. This alluvium is lacustrine sediments composed of fine clays over stratified silt deposits. According to recent studies (*9*) the source of this material was from the pre-existing glacial lake located at the head waters of the Mississippi River. The sediments were carried down the Mississippi River channel then were held in suspension by the turbulent water. These waters invaded the tributaries, where the turbulence diminished. Then, as the water evaporated, gently receded, or soaked into the soil mantle, these high clay sediments were left behind. Later, as the Mississippi River cut the channel deeper into the surface, these materials were left on high terraces. It is believed these sediments are relatively recent since they were laid down on the loess after deposition of loess ceased some 14,000 years ago. Zwingle is an important soil formed on these terraces.

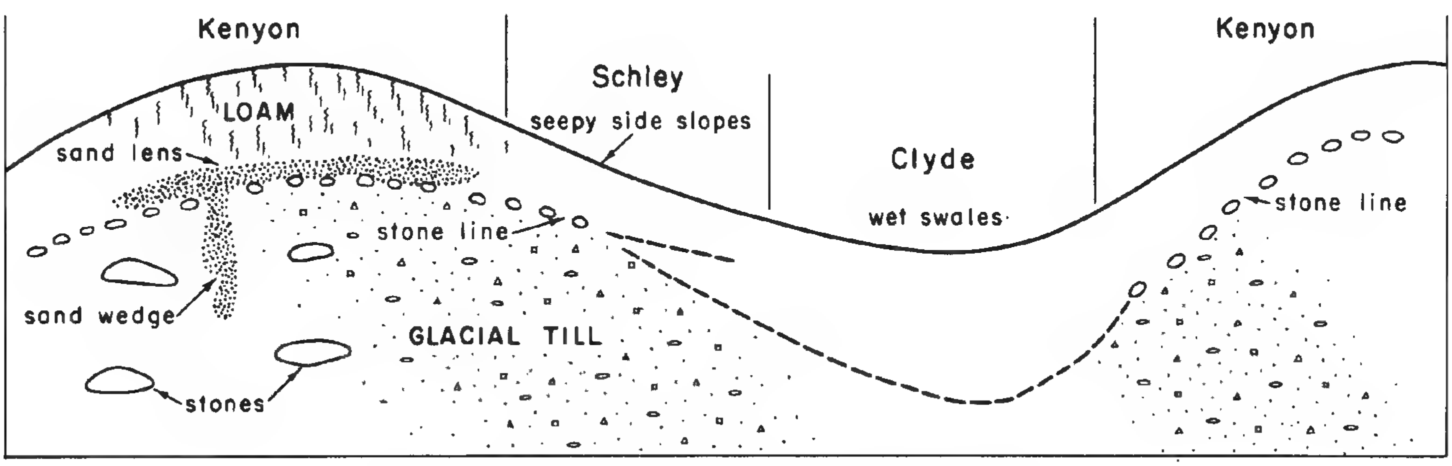

Figure 11. Parent materials of the Kenyon, Schley, and Clyde soils.

Another important alluvial deposit along the Mississippi River in Clinton County is around the city of Camanche. The river terraces consist predominantly of water-laid, sandy sediments. Finchford soils formed on these terraces.

Eolian sand, or wind-deposited sand, is on uplands and on benches. The wind-deposited sand consists largely of quartz that is fine or very fine in size and is highly resistant to weathering. It has not been altered appreciably since it was deposited. Among the soils in Clinton County that formed mainly in wind-deposited sand are the Dickinson, Lamont, and Sparta soils.

Organic deposits consist of plant material that has accumulated in old lakebeds or swamps that support a thick growth of water-loving plants. These wet areas in the county have poor drainage, which retards the decay of the accumulating plant remains. The acreage of organic soils is usually small, but the area south of Goose Lake is considerabely large. In Clinton County organic material ranges from about 20 to 60 inches in thickness, but in a few areas it is more than 60 inches thick. Palms soils have formed in this organic material.

Residuum, the material derived from the weathering of sedimentary rock in place, is a minor source of parent material in this county. The underlying bedrock belongs to the Ordovician and Silurian Systems (*3*). The Ordovician System is along the Mississippi River and along Deep Creek in Deep Creek Township. The remainder of the county is underlain by bedrock of the Silurian System. Sogn and Nordness soils formed partly from residuum.

climate

According to available evidence, the soils of Clinton County have been forming under the influence of a midcontinental, subhumid climate for at least 5,000 years. Between 5,000 and 16,000 years ago, the climate was conducive to the growth of forest vegetation (*10*). The morphology of most soils in the county indicates that the climate under which the soils formed is similar to the present one. At present the climate is fairly uniform throughout the county but is marked by wide seasonal extremes in temperature. Precipitation is distributed throughout the year.

Climate is a major factor in determining what soils form from the various parent materials. The rate and intensity of hydrolysis, carbonation, oxidation, and other important chemical reactions in the soil are influenced by climate. Temperature, rain, relative humidity, and length of the frost-free period are important in determining the vegetation.

The influence of the general climate of the region is somewhat modified by the local conditions in or near the forming soil. For example, south-facing, dry, sandy soils on slopes have a local climate, or microclimate, that is warmer and less humid than the average climate of nearby soils. Low-lying, poorly drained soils are wetter and colder than most soils around them. These conditions account for some of the difference in soils within the same general climatic region.

plant and animal life

All living organisms are important to soil formation (*14*). They include vegetation, animals, bacteria, and fungi. The vegetation is responsible for the content of organic matter, color of the surface layer, and the content of nutrients. Animals, such as earthworms and burrowing animals, help keep the soil open and porous. Bacteria and fungi decompose the vegetation, thus releasing nutrients for plant food.

The soils that formed under prairie grasses and water-tolerant grasses have a thick, dark colored surface layer. The Kenyon and Tama soils are examples.

The soils that formed under timber vegetation have a thinner, lighter colored surface layer. The organic matter, derived principally from leaves, was deposited only on the surface layer of the soil. The Fayette and Lindley soils are examples of these light-colored soils.

In many areas a number of soils first formed under prairie grasses and then under forest vegetation. In these soils the thickness and color of the surface layer is between those soils that formed entirely under grass and those that formed under trees. The Downs and Wapsie soils are examples.

The Downs, Fayette, and Tama soils are members of a group of soils that formed in the same parent material and under a comparable environment, except for native vegetation. Differences in native vegetation account for the main differences in morphology of soils of this group.

Man changes soil to meet his needs. Important changes take place in the soil when it is cultivated. Some of the changes have little influence on soil productivity, but other changes have drastic effects.

relief

Relief, or topography, influences soil formation mainly through its effect on drainage, runoff, and erosion. In Clinton County the relief ranges from level to very steep. Water soaks into the nearly level soils in areas that are not flooded. Where the slope is steeper, more water runs off the surface and less permeates into the soil. The Dinsdale, Klinger, and Maxfield soils are examples of soils that formed in the same kind of parent material under similar vegetation but differ because of topographic position. The Maxfield soils are level or nearly level along broad drainageways in uplands. The Klinger soils are on long, gentle, concave slopes. The Dinsdale soils are gently sloping to moderately sloping on uplands.

In depressions where water is collected and impounded for a period of time, the soils are poorly drained and have a distinct, light-colored subsurface layer and a gray subsoil. The Walford and Thorp soils are examples of soils that formed in depressions.

Soils that are steeply sloping have weak soil

formation. Most of the water that falls on them runs off. The Nordness soils are an example of such soils.

Soils that formed in alluvium, such as the Colo, Sawmill and Zook soils, are on bottom lands. The Zook soils are at low elevations, have a high water table, and impound water for short periods. The Colo and Sawmill soils are at slightly higher elevations.

Aspect, as well as the gradient, has a significant influence. South-facing slopes generally are warmer and drier than north-facing slopes, and consequently they support a different kind and amount of vegetation.

The influence of a porous, rapidly permeable parent material may override the influence of topography. The Dickinson soils, for example, are somewhat excessively drained because they have moderately rapid permeability, even though they are nearly level to moderately steep.

time

The length of time that the soil material remains in place and is acted on by the soil-forming processes affects the kind of soil that forms. Older or more strongly formed soils show well-defined genetic horizons. The Downs, Fayette, and Tama soils are examples. A younger soil shows only weakly developed horizons. Some soils formed in alluvium show little or no profile development because fresh material is deposited periodically. The materials have not been in place long enough for the climate and vegetation to produce well-defined genetic horizons in the profile. The Chaseburg soil is an example of a very young soil. In steep areas soil material is removed before it has had time to develop into a deep soil profile. The Sogn soils and some of the Timula soils are examples of this condition.

Another factor that can modify the effect of time is the resistance of materials. Soils that formed in material resistant to weathering, such as quartz sand, do not change much with time. The Chelsea and Sparta soils are examples of this condition.

Where such organic materials as trees have been buried by later deposition through the action of ice, water, or wind, the age of a landscape can be determined by a process known as radiocarbon dating (*13*).

The loess in which the Downs, Fayette, Mt. Carroll, and Tama soils formed is probably 14,000 to 20,000 years old. Recent studies by Ruhe and others (*12*) show that the "Iowan Erosion Surface" formed during the time of loess deposition. The Iowan surface beneath the loess could be as young as 14,000 years, which dates the end of the major loess deposition in Iowa. The surface not covered by loess can also be younger than the loess. The Iowan surface, where it is covered by loam surficial sediment, is younger than 14,000 years, and soils on the slopes are probable much younger. Such soils as the Aredale, Kenyon, and Readlyn are on this surface. The Clyde and Schley soils are younger because they are cut into and below this higher lying surface.

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glossary

AC soil. A soil having only an A and a C horizon. Commonly such soil formed in recent alluvium or on steep rocky slopes.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	More than 12

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to flooding.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15.2 to 38.1 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or arresting grazing for a prescribed period.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial

drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fine textured soil. Sandy clay, silty clay, and clay.

Foot slope. The inclined surface at the base of a hill.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Glacial drift (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial melt water.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced

by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual*. The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Muck. Dark colored, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it is generally low in relief.

Paha. A loess-capped prominence; an elliptical hill in an area of glacial drift.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to

permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.20 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Rippable. Bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 draw bar horsepower rating.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Slope (in tables). Slope is great enough that special practices are required to insure satisfactory performance of the soil for a specific use.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stone line. A concentration of coarse fragments in a soil. Generally it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and

granular. Structureless soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface horizon (A1, A2, or A3) below the surface layer.

Surface soil. The A horizon, includes all subdivisions of this horizon (A1, A2, A3).

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Recorded in the period 1951-1974 at Clinton, Iowa]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days[1]	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	28.9	11.8	20.4	56	-20	0	1.64	.81	2.30	4	8.5
February---	34.5	16.9	25.7	58	-15	0	1.29	.57	1.86	4	6.1
March------	45.0	26.4	35.7	77	0	23	2.54	1.34	3.52	6	7.3
April------	61.3	39.4	50.4	86	21	96	3.86	2.44	5.14	8	.7
May--------	72.4	49.9	61.2	92	32	356	4.02	2.44	5.42	8	.0
June-------	81.5	59.6	70.6	96	43	618	4.42	2.52	5.97	7	.0
July-------	84.8	63.5	74.2	97	47	750	4.04	2.34	5.42	7	.0
August-----	82.9	61.6	72.3	96	47	691	4.20	1.92	6.05	7	.0
September--	75.6	53.2	64.4	93	32	432	3.62	1.39	5.41	7	.0
October----	65.3	42.7	54.1	86	22	195	2.76	1.17	4.09	5	.2
November---	47.9	29.9	38.9	72	7	10	2.14	1.06	3.01	4	1.6
December---	34.2	18.5	26.4	62	-16	0	2.03	1.06	2.81	5	8.2
Year-----	59.5	39.5	49.5	98	-20	3,171	36.56	29.98	42.83	72	32.6

[1] A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Recorded in the period 1951-1974 at Clinton, Iowa]

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	April 16	April 28	May 9
2 years in 10 later than--	April 11	April 24	May 5
5 years in 10 later than--	April 2	April 16	April 27
First freezing temperature in fall:			
1 year in 10 earlier than--	October 19	October 11	September 25
2 years in 10 earlier than--	October 23	October 15	October 1
5 years in 10 earlier than--	November 1	October 24	October 11

TABLE 3.--GROWING SEASON

[Recorded in the period 1951-1974 at Clinton, Iowa]

Probability	Daily minimum temperature during growing season		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	194	171	148
8 years in 10	200	178	155
5 years in 10	211	190	166
2 years in 10	223	203	178
1 year in 10	229	209	184

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
11B	Colo-Ely complex, 2 to 5 percent slopes	9,830	2.2
41B	Sparta loamy fine sand, 2 to 5 percent slopes	3,900	0.9
41C	Sparta loamy fine sand, 5 to 9 percent slopes	3,155	0.7
41E	Sparta loamy fine sand, 9 to 18 percent slopes	1,315	0.3
42	Granby fine sandy loam, 0 to 2 percent slopes	1,140	0.3
51	Vesser silt loam, 0 to 2 percent slopes	905	0.2
54	Zook silty clay loam, 0 to 2 percent slopes	885	0.2
63C	Chelsea loamy fine sand, 5 to 9 percent slopes	780	0.2
63E	Chelsea loamy fine sand, 9 to 18 percent slopes	1,475	0.3
63G	Chelsea loamy fine sand, 18 to 30 percent slopes	480	0.1
65E2	Lindley loam, 14 to 18 percent slopes, moderately eroded	555	0.1
65E3	Lindley clay loam, 14 to 18 percent slopes, severely eroded	970	0.2
65F2	Lindley loam, 18 to 25 percent slopes, moderately eroded	355	0.1
65F3	Lindley clay loam, 18 to 25 percent slopes, severely eroded	2,555	0.6
65G	Lindley loam, 25 to 40 percent slopes	670	0.2
65G3	Lindley clay loam, 25 to 40 percent slopes, severely eroded	670	0.2
83B	Kenyon loam, 2 to 5 percent slopes	2,460	0.6
83C	Kenyon loam, 5 to 9 percent slopes	900	0.2
83C2	Kenyon loam, 5 to 9 percent slopes, moderately eroded	490	0.1
84	Clyde silty clay loam, 0 to 2 percent slopes	1,150	0.3
88	Nevin silty clay loam, 0 to 2 percent slopes	2,420	0.5
110C	Lamont fine sandy loam, 3 to 8 percent slopes	620	0.1
118	Garwin silty clay loam, 0 to 2 percent slopes	390	0.1
119	Muscatine silt loam, 1 to 3 percent slopes	2,250	0.5
120	Tama silt loam, 0 to 2 percent slopes	545	0.1
120B	Tama silt loam, 2 to 5 percent slopes	17,330	3.9
120C	Tama silt loam, 5 to 9 percent slopes	8,080	1.8
120C2	Tama silt loam, 5 to 9 percent slopes, moderately eroded	4,170	0.9
120D	Tama silt loam, 9 to 14 percent slopes	360	0.1
120D2	Tama silt loam, 9 to 14 percent slopes, moderately eroded	1,965	0.4
133	Colo silty clay loam, 0 to 2 percent slopes	10,415	2.3
133+	Colo silt loam, overwash, 0 to 2 percent slopes	7,010	1.6
142	Chaseburg silt loam, 0 to 2 percent slopes	8,985	2.0
142B	Chaseburg silt loam, 2 to 5 percent slopes	12,405	2.8
143	Brady sandy loam, 1 to 3 percent slopes	1,550	0.3
152	Marshan clay loam, 32 to 40 inches to sand and gravel, 0 to 2 percent slopes	8,740	2.0
159	Finchford loamy sand, 0 to 2 percent slopes	3,165	0.7
159C	Finchford loamy sand, 2 to 9 percent slopes	340	0.1
160	Walford silt loam, 0 to 1 percent slopes	1,475	0.3
162B	Downs silt loam, 2 to 5 percent slopes	3,155	0.7
162C	Downs silt loam, 5 to 9 percent slopes	6,725	1.5
162C2	Downs silt loam, 5 to 9 percent slopes, moderately eroded	7,920	1.8
162D	Downs silt loam, 9 to 14 percent slopes	1,260	0.3
162D2	Downs silt loam, 9 to 14 percent slopes, moderately eroded	9,070	2.0
162E2	Downs silt loam, 14 to 18 percent slopes, moderately eroded	2,045	0.5
163B	Fayette silt loam, 2 to 5 percent slopes	2,085	0.5
163C	Fayette silt loam, 5 to 9 percent slopes	1,740	0.4
163C2	Fayette silt loam, 5 to 9 percent slopes, moderately eroded	22,055	4.9
163D2	Fayette silt loam, 9 to 14 percent slopes, moderately eroded	20,045	4.5
163D3	Fayette silty clay loam, 9 to 14 percent slopes, severely eroded	15,530	3.5
163E2	Fayette silt loam, 14 to 18 percent slopes, moderately eroded	4,425	1.0
163E3	Fayette silty clay loam, 14 to 18 percent slopes, severely eroded	15,775	3.5
163F2	Fayette silt loam, 18 to 25 percent slopes, moderately eroded	3,045	0.7
163F3	Fayette silty clay loam, 18 to 25 percent slopes, severely eroded	16,025	3.6
163G	Fayette silt loam, 25 to 40 percent slopes	3,655	0.8
163G3	Fayette silty clay loam, 25 to 40 percent slopes, severely eroded	1,320	0.3
175	Dickinson fine sandy loam, 0 to 2 percent slopes	885	0.2
175B	Dickinson fine sandy loam, 2 to 5 percent slopes	4,730	1.1
175C	Dickinson fine sandy loam, 5 to 9 percent slopes	1,060	0.2
175D	Dickinson fine sandy loam, 9 to 18 percent slopes	280	0.1
177	Saude loam, 0 to 2 percent slopes	1,320	0.3
177B	Saude loam, 2 to 5 percent slopes	3,960	0.9
177C	Saude loam, 5 to 9 percent slopes	530	0.1
178	Waukee loam, 0 to 2 percent slopes	945	0.2
178B	Waukee loam, 2 to 5 percent slopes	1,005	0.2
179D2	Gara loam, 9 to 14 percent slopes, moderately eroded	525	0.1
184	Klinger silt loam, 1 to 3 percent slopes	7,945	1.8
213B	Rockton loam, 30 to 40 inches to limestone, 2 to 5 percent slopes	375	0.1
214B	Rockton loam, 20 to 30 inches to limestone, 2 to 5 percent slopes	415	0.1
214C	Rockton loam, 20 to 30 inches to limestone, 5 to 9 percent slopes	785	0.2
216B	Ripon silt loam, 20 to 30 inches to limestone, 2 to 5 percent slopes	520	0.1
216C	Ripon silt loam, 20 to 30 inches to limestone, 5 to 9 percent slopes	305	0.1

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
217B	Ripon silt loam, 30 to 40 inches to limestone, 2 to 5 percent slopes	1,100	0.2
217C	Ripon silt loam, 30 to 40 inches to limestone, 5 to 9 percent slopes	300	0.1
221	Palms muck, 0 to 3 percent slopes	1,225	0.3
226	Lawler loam, 32 to 40 inches to sand and gravel, 0 to 2 percent slopes	1,705	0.4
249	Zwingle silt loam, 0 to 2 percent slopes	485	0.1
249B	Zwingle silt loam, 2 to 5 percent slopes	205	*
284B	Flagler sandy loam, 1 to 5 percent slopes	810	0.2
284C	Flagler sandy loam, 5 to 9 percent slopes	710	0.2
285B	Burkhardt sandy loam, 2 to 5 percent slopes	180	*
285D	Burkhardt sandy loam, 5 to 14 percent slopes	550	0.1
285F2	Burkhardt sandy loam, 14 to 25 percent slopes, moderately eroded	515	0.1
291	Atterberry silt loam, 1 to 3 percent slopes	3,220	0.7
293F	Chelsea-Lamont-Fayette complex, 9 to 20 percent slopes	575	0.1
315	Fluvents-Ambraw complex, 0 to 2 percent slopes	14,815	3.3
350	Waukegan silt loam, 0 to 2 percent slopes	875	0.2
350B	Waukegan silt loam, 2 to 5 percent slopes	5,860	1.3
350C	Waukegan silt loam, 5 to 9 percent slopes	515	0.1
351	Atterberry silt loam, sandy substratum, 0 to 2 percent slopes	9,095	2.0
352B	Whittier silt loam, 2 to 5 percent slopes	515	0.1
353	Tell silt loam, 0 to 2 percent slopes	290	0.1
353B	Tell silt loam, 2 to 5 percent slopes	580	0.1
353C	Tell silt loam, 5 to 9 percent slopes	355	0.1
354	Aquolls, ponded	1,760	0.4
373E2	Timula silt loam, 12 to 20 percent slopes, moderately eroded	350	0.1
377B	Dinsdale silt loam, 2 to 5 percent slopes	8,765	2.0
377C	Dinsdale silt loam, 5 to 9 percent slopes	1,390	0.3
382	Maxfield silty clay loam, 0 to 2 percent slopes	4,780	1.1
399	Readlyn loam, 1 to 3 percent slopes	875	0.2
404	Thorp silt loam, 0 to 2 percent slopes	1,970	0.4
407B	Schley loam, 1 to 4 percent slopes	1,960	0.4
408B	Olin fine sandy loam, 2 to 5 percent slopes	610	0.1
409B	Dickinson fine sandy loam, loam substratum, 2 to 5 percent slopes	685	0.2
412D	Sogn loam, 5 to 14 percent slopes	720	0.2
420	Tama silt loam, benches, 0 to 2 percent slopes	350	0.1
420B	Tama silt loam, benches, 2 to 5 percent slopes	1,345	0.3
426B	Aredale loam, 2 to 5 percent slopes	1,125	0.3
428B	Ely silt loam, 2 to 5 percent slopes	2,005	0.5
462	Downs silt loam, benches, 0 to 2 percent slopes	235	0.1
462B	Downs silt loam, benches, 2 to 5 percent slopes	565	0.1
462C	Downs silt loam, benches, 5 to 9 percent slopes	515	0.1
463B	Fayette silt loam, benches, 2 to 5 percent slopes	400	0.1
478G	Rock outcrop-Nordness complex, 18 to 60 percent slopes	3,695	0.8
499D	Nordness silt loam, 5 to 14 percent slopes	540	0.1
499F	Nordness silt loam, 14 to 25 percent slopes	2,225	0.5
591B	Clyde-Schley complex, 1 to 4 percent slopes	775	0.2
662C2	Mt. Carroll silt loam, 5 to 9 percent slopes, moderately eroded	470	0.1
662D2	Mt. Carroll silt loam, 9 to 14 percent slopes, moderately eroded	1,310	0.3
662E2	Mt. Carroll silt loam, 14 to 18 percent slopes, moderately eroded	865	0.2
688	Koszta silt loam, 0 to 2 percent slopes	405	0.1
727	Udolpho loam, 32 to 40 inches to sand and gravel, 0 to 2 percent slopes	2,990	0.7
728	Udolpho loam, 24 to 32 inches to sand and gravel, 0 to 2 percent slopes	4,040	0.9
733	Calco silty clay loam, 0 to 2 percent slopes	805	0.2
760	Ansgar silt loam, 0 to 3 percent slopes	4,090	0.9
777B	Wapsie loam, 2 to 5 percent slopes	630	0.1
777C	Wapsie loam, 5 to 9 percent slopes	225	0.1
809B	Bertram sandy loam, 2 to 7 percent slopes	575	0.1
918	Garwin silty clay loam, sandy substratum, 0 to 2 percent slopes	5,450	1.2
919	Muscatine silt loam, sandy substratum, 0 to 2 percent slopes	2,930	0.7
920	Tama silt loam, sandy substratum, 0 to 2 percent slopes	2,035	0.5
920B	Tama silt loam, sandy substratum, 2 to 5 percent slopes	4,855	1.1
923	Coyne fine sandy loam, 0 to 2 percent slopes	295	0.1
933	Sawmill silty clay loam, 0 to 2 percent slopes	8,005	1.8
949	Zwingle Variant silty clay, 0 to 2 percent slopes	895	0.2
951F	Medary silt loam, 18 to 30 percent slopes	255	0.1
953	Darwin Variant silty clay, 0 to 2 percent slopes	155	*
960	Shaffton loam, 0 to 2 percent slopes	3,715	0.8
961	Ambraw silty clay loam, 0 to 2 percent slopes	5,500	1.2
962	Elvira silty clay loam, 0 to 2 percent slopes	2,390	0.5
963	Elvers silt loam, 0 to 2 percent slopes	360	0.1
976	Raddle silt loam, 0 to 2 percent slopes	1,475	0.3

See footnote at end of table.

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
1118	Garwin silty clay loam, benches, 0 to 2 percent slopes	755	0.2
1119	Muscatine silt loam, benches, 1 to 3 percent slopes	1,660	0.4
1142	Chaseburg silt loam, channeled, 0 to 2 percent slopes	2,130	0.5
1160	Walford silt loam, benches, 0 to 1 percent slopes	740	0.2
1291	Atterberry silt loam, benches, 1 to 3 percent slopes	3,455	0.8
1777	Wapsie Variant loam, 0 to 2 percent slopes	880	0.2
1954	Darwin silty clay, bedrock substratum, 0 to 2 percent slopes	300	0.1
5010	Pits, gravel	105	*
5030	Pits, quarries	160	*
5040	Orthents, loamy	535	0.1
	Water, sewage	30	*
	Water	8,895	2.0
	Total	444,800	100.0

* Less than 0.1 percent.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil. Only soils suitable for these crops are listed]

Soil name and map symbol	Corn	Soybeans	Oats	Grass-legume hay	Kentucky bluegrass	Smooth bromegrass	Bromegrass-alfalfa
	Bu	Bu	Bu	Tons	AUM*	AUM*	AUM*
11B----------------------- Colo-Ely	109	42	82	4.4	4.1	6.1	7.3
41B----------------------- Sparta	61	23	47	2.5	2.3	3.5	4.3
41C----------------------- Sparta	56	21	40	2.3	2.0	3.2	3.7
41E----------------------- Sparta	---	---	---	2.0	1.4	2.6	3.0
42------------------------ Granby	75	30	55	3.2	2.6	2.8	3.5
51------------------------ Vesser	95	36	52	4.0	3.7	5.0	5.6
54------------------------ Zook	96	36	72	4.0	4.0	4.0	4.2
63C----------------------- Chelsea	52	20	39	1.8	1.8	3.0	3.0
63E----------------------- Chelsea	---	---	35	1.5	1.5	2.5	2.5
63G----------------------- Chelsea	---	---	---	1.0	1.0	1.6	1.6
65E2---------------------- Lindley	---	---	---	1.5	2.0	3.0	3.3
65E3---------------------- Lindley	---	---	---	1.0	1.6	2.0	2.5
65F2, 65F3, 65G, 65G3----- Lindley	---	---	---	0.8	1.2	2.0	2.2
83B----------------------- Kenyon	113	43	90	4.7	4.2	6.6	7.8
83C----------------------- Kenyon	108	41	86	4.5	4.0	6.5	7.5
83C2---------------------- Kenyon	105	40	84	4.4	3.8	6.3	7.3
84------------------------ Clyde	102	39	82	4.0	6.6	5.5	6.6
88------------------------ Nevin	114	43	63	4.8	4.0	8.0	8.0
110C---------------------- Lamont	64	24	48	2.3	2.1	3.3	3.8
118----------------------- Garwin	125	47	94	5.0	4.1	7.5	8.3
119----------------------- Muscatine	129	49	96	5.5	4.2	7.6	9.1

See footnotes at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Soybeans	Oats	Grass-legume hay	Kentucky bluegrass	Smooth bromegrass	Bromegrass-alfalfa
	Bu	Bu	Bu	Tons	AUM*	AUM*	AUM*
120 Tama	127	49	95	5.3	4.2	7.6	8.6
120B Tama	125	48	95	5.2	4.2	7.5	8.6
120C Tama	120	46	90	5.0	4.0	7.1	8.3
120C2 Tama	117	44	88	4.9	3.8	7.0	8.1
120D Tama	111	42	83	4.7	3.7	6.6	7.8
120D2 Tama	108	41	81	4.5	3.3	6.3	7.5
133 Colo	104	40	78	4.2	4.2	5.5	7.0
133+ Colo	109	42	82	4.3	4.2	5.5	7.0
142 Chaseburg	108	41	86	4.5	4.1	6.3	7.5
142B Chaseburg	96	36	77	4.0	4.0	5.6	6.6
143 Brady	90	34	72	3.8	3.6	5.6	6.6
152 Marshan	101	38	81	4.0	4.1	5.6	6.6
159 Finchford	45	15	35	1.5	1.5	2.0	2.5
159C Finchford	35	14	30	1.2	1.3	1.6	2.0
160 Walford	99	38	75	3.5	3.0	5.1	5.8
162B Downs	119	45	95	5.0	4.1	7.1	8.3
162C Downs	114	43	91	4.8	4.0	6.8	8.1
162C2 Downs	111	42	89	4.7	3.8	6.6	7.8
162D Downs	105	40	84	4.4	3.8	6.3	7.3
162D2 Downs	102	39	82	4.3	3.6	6.1	7.1
162E2 Downs	87	33	69	3.7	3.5	5.1	6.1
163B Fayette	113	43	90	4.7	4.0	6.6	7.8
163C Fayette	108	41	86	4.5	3.8	6.5	7.5

See footnotes at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Soybeans	Oats	Grass-legume hay	Kentucky bluegrass	Smooth bromegrass	Bromegrass-alfalfa
	Bu	Bu	Bu	Tons	AUM*	AUM*	AUM*
163C2 Fayette	105	40	84	4.4	3.6	6.5	7.5
163D2 Fayette	99	38	80	4.2	3.6	6.0	7.0
163D3 Fayette	90	34	72	3.8	3.5	5.3	6.3
163E2 Fayette	84	32	67	3.5	3.3	5.0	5.8
163E3 Fayette	---	---	62	3.2	3.0	4.5	5.3
163F2 Fayette	---	---	60	3.4	3.1	4.8	5.6
163F3 Fayette	---	---	---	3.0	2.5	4.2	4.6
163G, 163G3 Fayette	---	---	---	3.0	3.0	4.2	5.0
175 Dickinson	83	32	62	3.0	2.7	5.0	5.0
175B Dickinson	81	31	60	3.0	2.7	4.8	5.0
175C Dickinson	76	29	57	2.8	2.5	4.5	4.6
175D Dickinson	67	25	50	2.3	2.0	4.0	3.8
177 Saude	78	30	62	3.3	3.0	4.6	5.5
177B Saude	76	29	61	3.2	3.0	4.5	5.3
177C Saude	71	27	57	3.0	2.8	4.3	5.0
178 Waukee	98	37	78	4.1	4.0	5.8	6.8
178B Waukee	96	36	77	4.0	4.0	5.6	6.6
179D2 Gara	75	28	41	3.1	2.5	4.5	5.1
184 Klinger	123	46	92	5.1	4.2	7.3	8.5
213B Rockton	96	36	77	4.0	3.6	5.6	6.6
214B Rockton	76	29	60	3.0	2.6	5.0	5.0
214C Rockton	71	27	57	2.8	2.5	4.2	4.6
216B Ripon	85	32	68	3.6	3.1	5.4	6.0

See footnotes at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Soybeans	Oats	Grass-legume hay	Kentucky bluegrass	Smooth bromegrass	Bromegrass-alfalfa
	Bu	Bu	Bu	Tons	AUM*	AUM*	AUM*
216C Ripon	80	30	64	3.4	3.0	4.8	5.6
217B Ripon	105	40	84	4.4	3.8	6.3	7.3
217C Ripon	90	37	65	4.0	4.2	5.8	7.0
221 Palms	80	30	65	3.2	3.3	4.5	5.3
226 Lawler	100	38	80	4.2	4.0	6.0	7.0
249 Zwingle	62	24	46	2.5	2.5	3.6	4.1
249B Zwingle	60	23	45	2.4	2.5	3.5	4.0
284B Flagler	70	26	56	2.9	2.1	4.1	4.8
284C Flagler	65	25	52	2.7	1.7	3.8	4.5
285B Burkhardt	41	15	33	1.4	1.1	1.7	2.3
285D Burkhardt	---	---	---	1.0	0.8	1.2	1.6
285F2 Burkhardt	---	---	---	0.5	0.6	0.8	0.8
291 Atterberry	125	47	93	5.0	4.0	7.1	8.3
293E Chelsea-Lamont-Fayette	---	---	---	1.9	1.9	2.9	3.1
315 Fluvents-Ambraw	---	---	---	---	---	---	---
350 Waukegan	89	34	71	3.8	3.3	5.4	6.3
350B Waukegan	87	33	70	3.7	3.3	5.3	6.1
350C Waukegan	82	31	66	3.5	3.1	4.8	5.6
351 Atterberry	120	46	90	5.0	4.1	7.1	8.3
352B Whittier	83	31	67	3.5	3.3	5.0	5.8
353 Tell	83	31	66	3.4	3.0	4.8	5.6
353B Tell	80	30	64	3.3	3.0	4.8	5.5
353C Tell	75	29	60	3.2	2.8	4.7	5.3

See footnotes at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Soybeans	Oats	Grass-legume hay	Kentucky bluegrass	Smooth bromegrass	Bromegrass-alfalfa
	Bu	Bu	Bu	Tons	AUM*	AUM*	AUM*
354**. Aquolls							
373E2 Timula	75	29	60	3.2	2.7	4.3	5.1
377B Dinsdale	119	45	89	5.0	4.1	7.1	8.3
377C Dinsdale	114	43	85	4.8	4.0	6.8	8.0
382 Maxfield	119	45	89	5.0	4.2	6.6	8.3
399 Readlyn	113	43	90	4.7	4.1	6.8	7.8
404 Thorp	90	35	72	3.8	3.3	4.7	5.3
407B Schley	100	38	80	4.2	4.0	6.0	7.0
408B Olin	97	37	73	4.1	3.0	5.8	6.8
409B Dickinson	86	33	69	3.6	3.1	5.1	6.0
412D Sogn	---	---	26	1.4	1.1	1.4	2.3
420 Tama	127	49	95	5.3	4.2	7.6	8.6
420B Tama	125	48	95	5.2	4.2	7.5	8.6
426B Aredale	113	43	90	4.7	4.2	6.8	7.8
428B Ely	124	47	93	5.3	4.0	7.5	8.8
462 Downs	121	46	97	5.0	4.1	7.1	8.3
462B Downs	119	45	95	5.0	4.1	7.1	8.3
462C Downs	114	43	91	4.8	4.0	6.8	8.1
463B Fayette	113	43	90	4.7	4.0	6.6	7.8
499D Nordness	---	---	20	1.2	1.0	1.2	2.0
499F Nordness	---	---	---	0.5	0.7	0.8	0.8
591B Clyde-Schley	102	39	82	4.1	5.7	5.8	6.9

See footnotes at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Soybeans	Oats	Grass-legume hay	Kentucky bluegrass	Smooth bromegrass	Bromegrass-alfalfa
	Bu	Bu	Bu	Tons	AUM*	AUM*	AUM*
662C2 Mt. Carroll	111	42	89	4.7	4.0	6.3	7.5
662D2 Mt. Carroll	102	39	82	4.3	3.8	6.0	7.0
662E2 Mt. Carroll	85	33	69	3.8	3.7	5.4	6.2
688 Koszta	108	41	59	4.5	3.7	6.5	7.5
727 Udolpho	94	36	75	4.0	3.7	4.8	5.6
728 Udolpho	79	30	63	3.0	3.0	3.8	4.6
733 Calco	99	38	84	4.2	3.6	5.4	7.0
760 Ansgar	93	35	74	3.7	6.1	5.5	6.1
777B Wapsie	70	27	56	2.9	2.6	4.1	4.8
777C Wapsie	65	25	52	2.7	2.3	3.8	4.5
809B Bertram	65	25	45	2.2	2.5	3.6	4.5
918 Garwin	120	46	90	5.0	4.1	7.1	8.3
919 Muscatine	126	48	95	5.2	4.1	7.5	8.6
920 Tama	122	46	92	5.1	2.9	7.3	8.5
920B Tama	120	45	90	5.0	2.9	7.1	8.3
923 Coyne	75	25	55	3.2	3.3	4.2	5.3
933 Sawmill	104	40	83	4.4	4.1	6.0	7.3
949 Zwingle Variant	60	23	48	2.4	2.5	3.5	4.0
951F Medary	---	---	---	1.0	1.2	1.2	1.6
953 Darwin Variant	50	19	38	21	1.5	3.0	3.5
960 Shaffton	93	35	70	3.9	3.6	4.2	5.6
961 Ambraw	85	32	64	3.6	3.3	4.1	6.0
962 Elvira	90	34	68	3.8	3.6	5.5	6.3
963 Elvers	115	44	92	2.5	3.0	3.5	4.1

See footnotes at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Soybeans	Oats	Grass-legume hay	Kentucky bluegrass	Smooth bromegrass	Bromegrass-alfalfa
	Bu	Bu	Bu	Tons	AUM*	AUM*	AUM*
976 Raddle	122	45	98	5.1	4.1	7.5	8.3
1118 Garwin	125	47	94	5.0	4.1	7.5	8.3
1119 Muscatine	129	49	96	5.5	4.2	7.6	9.1
1142 Chaseburg	---	---	---	3.0	3.0	3.8	5.0
1160 Walford	99	38	75	3.5	3.0	5.1	5.8
1291 Atterberry	125	47	93	5.0	4.0	7.5	8.3
1777 Wapsie Variant	76	29	57	3.2	2.6	4.5	5.3
1954 Darwin	70	28	53	3.0	3.0	3.8	5.0
5010**, 5030**. Pits							
5040**. Orthents							

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 6.--CAPABILITY CLASSES AND SUBCLASSES

[Miscellaneous areas are excluded. Absence of an entry indicates no acreage]

Class	Total acreage	Major management concerns (Subclass)		
		Erosion (e)	Wetness (w)	Soil problem (s)
		Acres	Acres	Acres
I	30,605	---	---	---
II	175,431	99,893	68,343	7,195
III	109,105	95,630	13,475	---
IV	33,819	24,759	300	8,760
V	5,629	---	5,629	---
VI	41,429	36,104	155	5,170
VII	16,971	10,195	---	6,776
VIII	---	---	---	---

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available]

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
41B, 41C, 41E------ Sparta	3s	Slight	Slight	Severe	Slight	Northern red oak----	70	Eastern white pine, red pine, jack pine.
						Red pine------------	---	
						Eastern white pine--	---	
						Jack pine-----------	---	
42----------------- Granby	4w	Slight	Severe	Severe	Severe	Pin oak-------------	70	Eastern white pine, pin oak.
						Quaking aspen-------	70	
						Eastern white pine--	75	
63C, 63E----------- Chelsea	3s	Slight	Slight	Moderate	Slight	White oak-----------	70	Eastern white pine, red pine, jack pine.
						Red pine------------	72	
						Eastern white pine--	83	
						Jack pine-----------	70	
						Quaking aspen-------	72	
						Northern red oak----	70	
63G---------------- Chelsea	3s	Moderate	Moderate	Moderate	Slight	White oak-----------	70	Eastern white pine, red pine, jack pine.
						Red pine------------	72	
						Eastern white pine--	83	
						Jack pine-----------	70	
						Quaking aspen-------	72	
						Northern red oak----	70	
65E2, 65E3, 65F2, 65F3-------------- Lindley	5r	Moderate	Moderate	Moderate	Slight	Northern red oak----	50	White oak, green ash, yellow-poplar.
						White oak-----------	---	
65G---------------- Lindley	4r	Moderate	Moderate	Slight	Slight	White oak-----------	60	White oak, green ash, yellow-poplar, post oak.
						Northern red oak----	---	
						White oak-----------	---	
						Post oak------------	---	
65G3--------------- Lindley	5r	Moderate	Moderate	Moderate	Slight	Northern red oak----	50	White oak, green ash, yellow-poplar, post oak.
						White oak-----------	---	
110C--------------- Lamont	4o	Slight	Slight	Slight	Moderate	Northern red oak----	55	Eastern white pine, white oak.
						White oak-----------	55	
142, 142B---------- Chaseburg	2o	Slight	Slight	Slight	Moderate	Northern red oak----	66	Red pine, eastern white pine, northern red oak, white oak.
						Sugar maple---------	---	
						American basswood---	---	
143---------------- Brady	3o	Slight	Slight	Slight	Slight	White oak-----------	70	Red maple, European larch, eastern white pine.
						Pin oak-------------	90	
						Eastern white pine--	70	
						Quaking aspen-------	85	
162B, 162C, 162C2, 162D, 162D2------- Downs	2o	Slight	Slight	Slight	Moderate	White oak-----------	80	Eastern white pine, northern red oak, green ash, yellow-poplar.
						Northern red oak----	80	
						Yellow-poplar-------	90	
						Black walnut--------	---	
162E2-------------- Downs	2r	Moderate	Moderate	Slight	Moderate	White oak-----------	80	Eastern white pine, northern red oak, green ash, yellow-poplar.
						Northern red oak----	80	
						Yellow-poplar-------	90	
						Black walnut--------	---	
163B, 163C, 163C2, 163D2, 163D3------ Fayette	2o	Slight	Slight	Slight	Moderate	White oak-----------	80	Eastern white pine, northern red oak, green ash, yellow-poplar, white oak.
						Northern red oak----	80	
						Yellow-poplar-------	90	
						Black walnut--------	---	

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordi-nation symbol	Management concerns: Erosion hazard	Management concerns: Equip-ment limita-tion	Management concerns: Seedling mortal-ity	Management concerns: Plant competi-tion	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
163E2, 163E3, 163F2, 163F3, 163G, 163G3 Fayette	2r	Moderate	Moderate	Slight	Moderate	White oak	80	Eastern white pine, northern red oak, green ash, yellow-poplar, white oak.
						Northern red oak	80	
						Yellow-poplar	90	
						Black walnut	---	
179D2 Gara	4o	Slight	Slight	Slight	Slight	White oak	55	Eastern white pine, red pine, white oak, northern red oak.
						Northern red oak	55	
249, 249B Zwingle	3w	Slight	Severe	Moderate	Severe	Eastern cottonwood	90	Eastern cottonwood.
						Silver maple	80	
291 Atterberry	3o	Slight	Slight	Slight	Moderate	Northern red oak	65	Eastern white pine, red pine, silver maple, green ash.
						White oak	65	
						Silver maple	90	
						White ash	65	
						Green ash	65	
293E*: Chelsea	3s	Slight	Slight	Moderate	Slight	White oak	70	Eastern white pine, red pine, jack pine.
						Red pine	72	
						Eastern white pine	83	
						Jack pine	70	
						Quaking aspen	72	
						Northern red oak	70	
Lamont	4o	Slight	Slight	Slight	Moderate	Northern red oak	55	Eastern white pine, white oak.
						White oak	55	
Fayette	2o	Slight	Slight	Slight	Moderate	White oak	80	Eastern white pine, northern red oak, green ash, yellow-poplar.
						Northern red oak	80	
						Yellow-poplar	90	
						Black walnut	---	
351 Atterberry	3o	Slight	Slight	Slight	Moderate	White oak	70	Eastern white pine, red pine, white oak.
						Northern red oak	70	
						Green ash	---	
						Bur oak	---	
352B Whittier	3o	Slight	Slight	Slight	Moderate	White oak	65	Eastern white pine, red pine, black walnut, sugar maple, white oak.
						Northern red oak	65	
353, 353B, 353C Tell	3o	Slight	Slight	Slight	Moderate	Northern red oak	65	Red pine, eastern white pine, white oak, northern red oak.
						Sugar maple	---	
						White oak	---	
373E2 Timula	3r	Moderate	Moderate	Slight	Slight	White oak	70	Eastern white pine, red pine, white oak.
						Northern red oak	---	
						Green ash	---	
						Bur oak	---	
407B Schley	4o	Slight	Slight	Slight	Moderate	White oak	55	Eastern white pine, red pine, European larch, black walnut, sugar maple.
						Northern red oak	55	
462, 462B, 462C Downs	2o	Slight	Slight	Slight	Moderate	White oak	80	Eastern white pine, northern red oak, green ash, yellow-poplar.
						Northern red oak	80	
						Yellow-poplar	90	
						Black walnut	---	

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
463B Fayette	2o	Slight	Slight	Slight	Moderate	White oak Northern red oak Yellow-poplar Black walnut	80 80 90 ---	Eastern white pine, northern red oak, green ash, yellow-poplar.
478G*: Rock outcrop.								
Nordness	5d	Moderate	Moderate	Severe	Moderate	Northern red oak White oak	45 45	
499D, 499F Nordness	5d	Moderate	Moderate	Severe	Moderate	Northern red oak White oak	45 45	
591B*: Clyde.								
Schley	4o	Slight	Slight	Slight	Moderate	White oak Northern red oak	55 55	Eastern white pine, red pine, black walnut, sugar maple.
662C2, 662D2 Mt. Carroll	2o	Slight	Slight	Slight	Moderate	Yellow-poplar White oak Northern red oak Black walnut	90 80 80 ---	White oak, black walnut, northern red oak, green ash, red pine, sugar maple.
662E2 Mt. Carroll	2r	Moderate	Moderate	Slight	Moderate	Yellow-poplar White oak Northern red oak Black walnut	90 80 80 ---	White oak, black walnut, northern red oak, green ash, red pine, sugar maple.
688 Koszta	3o	Slight	Slight	Slight	Moderate	White oak Northern red oak	65 70	Eastern white pine, red pine, European larch, sugar maple.
727, 728 Udolpho	3o	Slight	Slight	Slight	Slight	Eastern cottonwood Green ash American elm	90 50 55	Eastern cottonwood.
777B, 777C Wapsie	4o	Slight	Slight	Slight	Moderate	Northern red oak White oak	55 55	Eastern white pine, red pine, European larch, sugar maple.
949 Zwingle Variant	3w	Slight	Severe	Moderate	Severe	Eastern cottonwood Silver maple	90 80	Eastern cottonwood.
951F Medary	4c	Moderate	Severe	Moderate	Severe	Northern red oak Sugar maple American basswood	65 --- ---	Eastern white pine, red pine, northern red oak.
963 Elvers	4w	Slight	Severe	Moderate	Severe	Eastern cottonwood Silver maple White ash	80 --- ---	Eastern cottonwood, silver maple, white ash.
1142 Chaseburg	4o	Slight	Slight	Slight	Slight	Northern red oak Sugar maple American basswood	65 --- ---	Red pine, eastern white pine.
1291 Atterberry	3o	Slight	Slight	Slight	Moderate	Northern red oak White oak Silver maple White ash Green ash	65 65 90 65 65	Eastern white pine, red pine, silver maple, green ash.
1777 Wapsie Variant	4o	Slight	Slight	Slight	Moderate	Northern red oak White oak	55 55	Eastern white pine, red pine, sugar maple, white oak, northern red oak.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

[The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the given height on that soil]

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of-- <8	8-15	16-25	26-35	>35
11B*:					
Colo	Redosier dogwood, silky dogwood.	Autumn olive, Tatarian honeysuckle, Zabel honeysuckle.	Eastern white pine, Amur maple, northern white-cedar.	Green ash	Silver maple, eastern cottonwood.
Ely	Redosier dogwood, gray dogwood.	Lilac, Tatarian honeysuckle, autumn-olive.	Eastern redcedar, Amur maple.	Red pine, Norway spruce, common hackberry.	Eastern cottonwood, silver maple.
41B, 41C, 41E Sparta	Coralberry, common ninebark.	Lilac, autumn-olive, Siberian peashrub.	Austrian pine, Scotch pine.	---	---
42 Granby	Gray dogwood, dwarf purple willow.	Redosier dogwood, silky dogwood.	Amur maple	---	---
51 Vesser	Redosier dogwood, silky dogwood.	Autumn-olive, Tatarian honeysuckle, Zabel honeysuckle.	Amur maple, northern white-cedar, white spruce.	Green ash	Eastern cottonwood, silver maple.
54 Zook	Coralberry, common ninebark.	Tatarian honeysuckle, silky dogwood, autumn-olive.	Amur maple, Norway spruce, eastern white pine.	Green ash, common hackberry.	Eastern cottonwood, silver maple.
63C, 63E, 63G Chelsea	Lilac, American plum.	Eastern redcedar, northern white-cedar.	Scotch pine, common hackberry.	---	---
65E2, 65E3, 65F2, 65F3, 65G, 65G3 Lindley	Gray dogwood, silky dogwood.	Lilac, Amur honeysuckle, autumn-olive.	Eastern redcedar, northern white-cedar, Amur maple.	Eastern white pine, Scotch pine, Austrian pine.	Eastern cottonwood, silver maple.
83B, 83C, 83C2 Kenyon	Redosier dogwood, gray dogwood.	Lilac, autumn-olive, Tatarian honeysuckle.	Eastern redcedar, Amur maple.	Red pine, Norway spruce, common hackberry.	Eastern cottonwood, silver maple.
84 Clyde	Redosier dogwood, silky dogwood.	Autumn-olive, Tatarian honeysuckle, Zabel honeysuckle.	Amur maple, northern white-cedar, eastern white pine.	Green ash	Eastern cottonwood, silver maple.
88 Nevin	Redosier dogwood, gray dogwood.	Lilac, autumn-olive, Tatarian honeysuckle.	Eastern redcedar, Amur maple.	Red pine, Norway spruce, common hackberry.	Eastern cottonwood, silver maple.
110C Lamont	Redosier dogwood, gray dogwood.	Lilac, autumn-olive, Tatarian honeysuckle.	Eastern redcedar, Amur maple.	Red pine, Norway spruce, common hackberry.	Eastern cottonwood, silver maple.

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of-- <8	8-15	16-25	26-35	>35
118 Garwin	Redosier dogwood, silky dogwood.	Autumn-olive, Tatarian honeysuckle, Zabel honeysuckle.	Amur maple, northern white-cedar, Norway spruce.	Green ash	Eastern cottonwood, silver maple.
119 Muscatine	Redosier dogwood, gray dogwood.	Lilac, Tatarian honeysuckle, autumn-olive.	Eastern redcedar, Amur maple.	Red pine, Norway spruce, common hackberry.	Eastern cottonwood, silver maple.
120, 120B, 120C, 120C2, 120D, 120D2 Tama	Redosier dogwood, gray dogwood.	Autumn-olive, Tatarian honeysuckle.	Eastern redcedar, Amur maple.	Red pine, Norway spruce, common hackberry.	Silver maple, eastern cottonwood.
133, 133+ Colo	Redosier dogwood, silky dogwood.	Autumn-olive, Tatarian honeysuckle, Zabel honeysuckle.	White spruce, Amur maple, northern white-cedar.	Green ash	Silver maple, eastern cottonwood.
142, 142B Chaseburg	Redosier dogwood, gray dogwood.	Northern white-cedar, lilac, common ninebark, silky dogwood.	White spruce, Norway spruce.	Eastern white pine, red pine.	Eastern cottonwood.
143 Brady	Gray dogwood, dwarf purple willow.	Redosier dogwood, silky dogwood.	Amur maple, Norway spruce.	Eastern white pine, green ash.	Eastern cottonwood.
152 Marshan	Coralberry, common ninebark.	Redosier dogwood, northern white-cedar, Tatarian honeysuckle.	Eastern white pine, Siberian crabapple, Amur maple, white spruce.	Golden willow, silver maple, green ash.	Eastern cottonwood.
159, 159C Finchford	Coralberry, gray dogwood.	Russian-olive, eastern redcedar, autumn-olive.	Common hackberry, green ash.	---	---
160 Walford	Redosier dogwood, silky dogwood.	Autumn-olive, Tatarian honeysuckle, Zabel honeysuckle.	Amur maple, northern white-cedar, Norway spruce.	Green ash	Eastern cottonwood, silver maple.
162B, 162C, 162C2, 162D, 162D2, 162E2 Downs	Redosier dogwood, gray dogwood.	Lilac, autumn-olive, Tatarian honeysuckle.	Eastern redcedar, Amur maple.	Red pine, Norway spruce, common hackberry.	Eastern cottonwood, silver maple.
163B, 163C, 163C2, 163D2, 163D3, 163E2, 163E3 Fayette	Redosier dogwood, gray dogwood.	Tatarian honeysuckle, lilac, autumn-olive.	Amur maple, eastern redcedar.	Common hackberry, red pine, Norway spruce.	Eastern cottonwood, silver maple.

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
163F2, 163F3, 163G, 163G3------ Fayette	Redosier dogwood, silky dogwood.	Lilac, autumn-olive, Tatarian honeysuckle, Amur honeysuckle.	White spruce, Northern white-cedar, Amur maple, eastern redcedar.	Eastern white pine, Norway spruce, Scotch pine, green ash.	Eastern cottonwood, silver maple.
175, 175B, 175C, 175D------------- Dickinson	Redosier dogwood, gray dogwood.	Lilac, Tatarian honeysuckle, autumn-olive.	Eastern redcedar, Amur maple.	Red pine, Norway spruce, common hackberry.	Silver maple, eastern cottonwood.
177, 177B, 177C--- Saude	Redosier dogwood, gray dogwood.	Lilac, Tatarian honeysuckle, autumn-olive.	Eastern redcedar, Amur maple.	Red pine, Norway spruce, common hackberry.	Eastern cottonwood, silver maple.
178, 178B--------- Waukee	Redosier dogwood, gray dogwood.	Tatarian honeysuckle, lilac, autumn-olive.	Amur maple, eastern redcedar.	Red pine, Norway spruce, common hackberry.	Silver maple, eastern cottonwood.
179D2------------- Gara	Redosier dogwood, gray dogwood.	Lilac, autumn-olive, Tatarian honeysuckle.	Eastern redcedar, Amur maple.	Red pine, Norway spruce, common hackberry.	Eastern cottonwood, silver maple.
184--------------- Klinger	Redosier dogwood, gray dogwood.	Lilac, autumn-olive, Tatarian honeysuckle.	Eastern redcedar, Amur maple.	Red pine, Norway spruce, common hackberry.	Eastern cottonwood, silver maple.
213B, 214B, 214C-- Rockton	Redosier dogwood, gray dogwood.	Siberian peashrub, silky dogwood, Tatarian honeysuckle, lilac.	Eastern redcedar, northern white-cedar, blue spruce, eastern white pine, common hackberry.	Green ash, silver maple.	---
216B, 216C, 217B, 217C------------- Ripon	Redosier dogwood, gray dogwood.	Northern white-cedar, lilac, common ninebark, silky dogwood.	White spruce, Norway spruce.	Eastern white pine, red pine.	---
221--------------- Palms	Redosier dogwood, gray dogwood.	Silky dogwood, Tatarian honeysuckle, white spruce.	Eastern white pine, white spruce.	Northern white-cedar, Norway spruce, Scotch pine.	Green ash.
226--------------- Lawler	Redosier dogwood, gray dogwood.	Tatarian honeysuckle, lilac, autumn-olive.	Amur maple, eastern redcedar.	Common hackberry, red pine, Norway spruce.	Eastern cottonwood, silver maple.
249, 249B--------- Zwingle	Redosier dogwood, silky dogwood.	Autumn-olive, Tatarian honeysuckle, Zabel honeysuckle.	Amur maple, northern white-cedar, white spruce.	Green ash---------	Eastern cottonwood, silver maple.

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of-- <8	8-15	16-25	26-35	>35
284B, 284C Flagler	Redosier dogwood, gray dogwood.	Tatarian honeysuckle, lilac, autumn-olive.	Eastern redcedar, Amur maple.	Red pine, Norway spruce, common hackberry.	Eastern cottonwood, silver maple.
285B, 285D, 285F2 Burkhardt	Redosier dogwood, gray dogwood.	Siberian peashrub, lilac, eastern redcedar, Russian-olive.	Norway spruce, common hackberry.	Eastern white pine, red pine, jack pine.	---
291 Atterberry	Silky dogwood	Northern white-cedar, lilac, Tatarian honeysuckle.	White spruce, Norway spruce.	Eastern white pine, red pine, green ash.	Silver maple, eastern cottonwood.
293E*:					
Chelsea	Redosier dogwood, gray dogwood.	Lilac, Tatarian honeysuckle.	Scotch pine, eastern redcedar.	---	---
Lamont	Redosier dogwood, gray dogwood.	Tatarian honeysuckle, lilac.	Eastern redcedar, Amur maple.	Red pine, Norway spruce, common hackberry.	Eastern cottonwood, silver maple.
Fayette	Redosier dogwood, gray dogwood.	Tatarian honeysuckle, bloodtwig dogwood, Siberian dogwood.	Amur maple, eastern redcedar.	Common hackberry, red pine, Norway spruce.	Eastern cottonwood, silver maple.
315*: Fluvents.					
Ambraw	Gray dogwood, redosier dogwood.	Silky dogwood, Zabel honeysuckle, Tatarian honeysuckle.	Amur maple, northern white-cedar.	Green ash, common hackberry.	Eastern cottonwood.
350, 350B, 350C Waukegan	Redosier dogwood, gray dogwood.	Lilac, American plum, Tatarian honeysuckle.	Eastern redcedar, red pine, northern white-cedar, common hackberry, white spruce.	Green ash, eastern white pine.	Eastern cottonwood.
351 Atterberry	Redosier dogwood, gray dogwood.	Autumn-olive, Tatarian honeysuckle, lilac.	Eastern redcedar, Amur maple.	Red pine, Norway spruce, common hackberry.	Eastern cottonwood, silver maple.
352B Whittier	Redosier dogwood, gray dogwood.	Bloodtwig dogwood, Tatarian honeysuckle, Siberian dogwood.	Eastern redcedar, Amur maple.	Red pine, Norway spruce, common hackberry.	Eastern cottonwood, silver maple.
353, 353B, 353C Tell	Redosier dogwood, gray dogwood.	Northern white-cedar, silky dogwood, common ninebark, lilac.	White spruce, Norway spruce.	Eastern white pine, red pine.	Eastern cottonwood, silver maple.
354*. Aquolls					
373E2 Timula	Gray dogwood, redosier dogwood.	Silky dogwood, autumn-olive, Tatarian honeysuckle.	Amur maple, eastern redcedar.	Norway spruce, eastern white pine, green ash.	Eastern cottonwood.

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
377B, 377C-------- Dinsdale	Redosier dogwood, gray dogwood.	Autumn-olive, Tatarian honeysuckle, lilac.	Eastern redcedar, Amur maple.	Red pine, Norway spruce, common hackberry.	Eastern cottonwood, silver maple.
382--------------- Maxfield	Redosier dogwood, silky dogwood.	Tatarian honeysuckle, lilac, autumn-olive.	Amur maple, Zabel honeysuckle, northern white-cedar.	Green ash---------	Silver maple, eastern cottonwood.
399--------------- Readlyn	Redosier dogwood, gray dogwood.	Autumn-olive, Tatarian honeysuckle, lilac.	Eastern redcedar, Amur maple.	Red pine, Norway spruce, common hackberry.	Eastern cottonwood, silver maple.
404--------------- Thorp	Redosier dogwood, gray dogwood.	Silky dogwood, Amur maple, Tatarian honeysuckle.	Russian-olive, eastern redcedar.	Green ash, Norway spruce.	Eastern cottonwood.
407B-------------- Schley	Redosier dogwood, gray dogwood.	Autumn-olive, Tatarian honeysuckle, lilac.	Eastern redcedar, Amur maple.	Red pine, Norway spruce, common hackberry.	Eastern cottonwood, silver maple.
408B-------------- Olin	Redosier dogwood, gray dogwood.	Autumn-olive, Tatarian honeysuckle, lilac.	Eastern redcedar, Amur maple.	Red pine, Norway spruce, common hackberry.	Eastern cottonwood, silver maple.
409B-------------- Dickinson	Redosier dogwood, gray dogwood.	Tatarian honeysuckle, lilac, autumn-olive.	Eastern redcedar, Amur maple.	Red pine, Norway spruce, common hackberry.	Silver maple, eastern cottonwood.
412D-------------- Sogn	Coralberry, common ninebark.	Eastern redcedar, Russian-olive.	Green ash, common hackberry.	---	---
420, 420B--------- Tama	Redosier dogwood, gray dogwood.	Autumn-olive, lilac, Tatarian honeysuckle.	Eastern redcedar, Amur maple.	Red pine, Norway spruce, common hackberry.	Silver maple, eastern cottonwood.
426B-------------- Aredale	Redosier dogwood, gray dogwood.	Autumn-olive, Tatarian honeysuckle, lilac.	Eastern redcedar, Amur maple.	Red pine, Norway spruce, common hackberry.	Eastern cottonwood, silver maple.
428B-------------- Ely	Redosier dogwood, gray dogwood.	Autumn-olive, Tatarian honeysuckle, lilac.	Eastern redcedar, Amur maple.	Red pine, Norway spruce, common hackberry.	Eastern cottonwood, silver maple.
462, 462B, 462C--- Downs	Redosier dogwood, gray dogwood.	Autumn-olive, Tatarian honeysuckle, lilac.	Eastern redcedar, Amur maple.	Red pine, Norway spruce, common hackberry.	Eastern cottonwood, silver maple.
463B-------------- Fayette	Redosier dogwood, gray dogwood.	Tatarian honeysuckle, lilac, autumn-olive.	Amur maple, eastern redcedar.	Common hackberry, red pine, Norway spruce.	Eastern cottonwood, silver maple.
478G*: Rock outcrop.					

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
478G*: Nordness	Lilac, common ninebark, coralberry.	---	---	---	---
499D, 499F Nordness	Lilac, coralberry, common ninebark.	Eastern redcedar, autumn-olive, Russian-olive.	Scotch pine, ponderosa pine, green ash.	---	---
591B*: Clyde	Redosier dogwood, silky dogwood.	Tatarian honeysuckle, Zabel honeysuckle.	Amur maple, northern white-cedar, white spruce.	Green ash	Eastern cottonwood, silver maple.
Schley	Redosier dogwood, gray dogwood.	Autumn-olive, Tatarian honeysuckle, lilac.	Eastern redcedar, Amur maple.	Red pine, Norway spruce, common hackberry.	Eastern cottonwood, silver maple.
662C2, 662D2, 662E2 Mt. Carroll	Redosier dogwood, gray dogwood.	Silky dogwood, autumn-olive, Amur honeysuckle.	Northern white-cedar, Amur maple, eastern redcedar.	Eastern white pine, Douglas-fir, Norway spruce, Scotch pine.	Eastern cottonwood.
688 Koszta	Redosier dogwood, gray dogwood.	Autumn-olive, Tatarian honeysuckle, lilac.	Eastern redcedar, Amur maple.	Red pine, Norway spruce, common hackberry.	Eastern cottonwood, silver maple.
727, 728 Udolpho	Redosier dogwood, gray dogwood.	Northern white-cedar, Tatarian honeysuckle.	Norway spruce, Amur maple, eastern white pine, Siberian crabapple.	Silver maple, green ash, golden willow.	Eastern cottonwood.
733 Calco	Redosier dogwood, common ninebark.	Autumn-olive, Tatarian honeysuckle, Zabel honeysuckle.	Amur maple, northern white-cedar.	Green ash	Silver maple, eastern cottonwood.
760 Ansgar	Redosier dogwood, silky dogwood.	Autumn-olive, Tatarian honeysuckle, Zabel honeysuckle.	Amur maple, northern white-cedar, eastern white pine.	Green ash	Eastern cottonwood, silver maple.
777B, 777C Wapsie	Redosier dogwood, gray dogwood.	Autumn-olive, Tatarian honeysuckle, lilac.	Eastern redcedar, Amur maple.	Red pine, Norway spruce, common hackberry.	Eastern cottonwood, silver maple.
809B Bertram	Coralberry, lilac, common ninebark.	Autumn-olive, Russian-olive, eastern redcedar.	Scotch pine, common hackberry, green ash.	---	---

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of-- <8	8-15	16-25	26-35	>35
918 Garwin	Redosier dogwood, silky dogwood.	American plum, Tatarian honeysuckle, lilac, Zabel honeysuckle.	Amur maple, northern white-cedar.	Green ash	Eastern cottonwood, silver maple.
919 Muscatine	Redosier dogwood, gray dogwood.	Autumn-olive, Tatarian honeysuckle, lilac.	Eastern redcedar, Amur maple.	Red pine, Norway spruce, common hackberry.	Eastern cottonwood, silver maple.
920, 920B Tama	Redosier dogwood, gray dogwood.	American plum, Tatarian honeysuckle, lilac.	Eastern redcedar, Amur maple.	Red pine, Norway spruce, common hackberry.	Eastern cottonwood, silver maple.
923 Coyne	Redosier dogwood, gray dogwood.	Autumn-olive, silky dogwood, Amur honeysuckle.	Russian-olive, eastern redcedar.	Scotch pine, Norway spruce, eastern white pine.	Silver maple, eastern cottonwood.
933 Sawmill	Gray dogwood, redosier dogwood.	Silky dogwood, Tatarian honeysuckle, American plum.	Amur maple, Norway spruce, northern white-cedar.	Green ash, common hackberry.	Eastern cottonwood, silver maple.
949 Zwingle Variant	Redosier dogwood, silky dogwood.	American plum, Tatarian honeysuckle, Zabel honeysuckle.	Amur maple, northern white-cedar, Norway spruce.	Green ash	Eastern cottonwood, silver maple.
951F Medary	Redosier dogwood, silky dogwood.	Northern white-cedar, Tatarian honeysuckle, lilac, common ninebark, gray dogwood.	White spruce, Norway spruce, Amur maple.	Green ash, common hackberry, eastern white pine, red pine.	---
953 Darwin Variant	Gray dogwood, common ninebark.	Siberian peashrub, Tatarian honeysuckle.	Amur maple, eastern redcedar.	Silver maple, eastern cottonwood.	---
960 Shaffton	Redosier dogwood, gray dogwood.	Tatarian honeysuckle, lilac, autumn-olive.	Amur maple, eastern redcedar.	Red pine, Norway spruce, common hackberry.	Eastern cottonwood, silver maple.
961 Ambraw	Gray dogwood, redosier dogwood.	Silky dogwood, Tatarian honeysuckle, autumn-olive.	Amur maple, Norway spruce, northern white-cedar.	Green ash, common hackberry.	Eastern cottonwood, silver maple.
962 Elvira	Silky dogwood, redosier dogwood.	Zabel honeysuckle, Tatarian honeysuckle.	Northern white-cedar, Amur maple.	Green ash, common hackberry.	Silver maple, eastern cottonwood.
963 Elvers	Coralberry, common ninebark.	Silky dogwood, Tatarian honeysuckle.	Amur maple, Norway spruce.	Green ash, common hackberry.	Eastern cottonwood, silver maple.
976 Raddle	Redosier dogwood, gray dogwood.	Autumn-olive, silky dogwood.	Amur maple, Russian-olive, blue spruce.	Eastern white pine, Norway spruce.	Eastern cottonwood, silver maple.

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
1118. Garwin	Redosier dogwood, silky dogwood.	Autumn-olive, Tatarian honeysuckle, Zabel honeysuckle.	Amur maple, northern white-cedar, Norway spruce.	Green ash	Eastern cottonwood, silver maple.
1119. Muscatine	Redosier dogwood, gray dogwood.	Autumn-olive, Tatarian honeysuckle, lilac.	Eastern redcedar, Amur maple.	Red pine, Norway spruce, common hackberry.	Eastern cottonwood, silver maple.
1142. Chaseburg	Redosier dogwood, gray dogwood.	Northern white-cedar, lilac, common ninebark, silky dogwood.	White spruce, Norway spruce.	Eastern white pine, red pine.	Eastern cottonwood.
1160. Walford	Redosier dogwood, silky dogwood.	Autumn-olive, Tatarian honeysuckle, Zabel honeysuckle.	Amur maple, northern white-cedar, Norway spruce.	Green ash	Eastern cottonwood, silver maple.
1291. Atterberry	Redosier dogwood, silky dogwood.	Tatarian honeysuckle, lilac, American plum.	White spruce, blue spruce, eastern redcedar.	Green ash, common hackberry.	Eastern cottonwood, silver maple.
1777. Wapsie Variant	Redosier dogwood, gray dogwood.	Autumn-olive, Tatarian honeysuckle, lilac, Siberian dogwood.	Eastern redcedar, Amur maple.	Red pine, Norway spruce, common hackberry.	Eastern cottonwood, silver maple.
1954. Darwin	Redosier dogwood, gray dogwood.	Silky dogwood, Tatarian honeysuckle, autumn-olive.	Amur maple, Norway spruce, white spruce.	Green ash, common hackberry.	Eastern cottonwood, silver maple.
5010*, 5030*. Pits					
5040*. Orthents					

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
11B*:					
Colo	Severe: floods, wetness.	Moderate: floods, wetness.	Severe: wetness, floods.	Moderate: floods, wetness.	Severe: floods.
Ely	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness.	Slight	Slight.
41B Sparta	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: droughty.
41C Sparta	Slight	Slight	Severe: slope.	Slight	Moderate: droughty.
41E Sparta	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
42 Granby	Severe: floods, wetness.	Moderate: floods, wetness.	Severe: wetness, floods.	Moderate: floods, wetness.	Severe: floods.
51 Vesser	Severe: floods, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, floods.
54 Zook	Severe: wetness, floods.	Moderate: wetness, percs slowly.	Severe: wetness, floods.	Moderate: wetness.	Severe: floods.
63C Chelsea	Slight	Slight	Severe: slope.	Slight	Moderate: droughty.
63E Chelsea	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope, droughty.
63G Chelsea	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
65E2, 65E3, 65F2, 65F3 Lindley	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
65G, 65G3 Lindley	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
83B Kenyon	Slight	Slight	Moderate: slope.	Slight	Slight.
83C, 83C2 Kenyon	Slight	Slight	Severe: slope.	Slight	Slight.
84 Clyde	Severe: floods, wetness.	Moderate: floods, wetness.	Severe: floods, wetness.	Moderate: wetness, floods.	Severe: floods.
88 Nevin	Severe: floods.	Moderate: wetness.	Moderate: wetness.	Slight	Slight.
110C Lamont	Slight	Slight	Severe: slope.	Slight	Slight.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
118 Garwin	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
119 Muscatine	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness.	Slight	Slight.
120 Tama	Slight	Slight	Slight	Slight	Slight.
120B Tama	Slight	Slight	Moderate: slope.	Slight	Slight.
120C, 120C2 Tama	Slight	Slight	Severe: slope.	Slight	Slight.
120D, 120D2 Tama	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
133 Colo	Severe: floods, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, floods.
133+ Colo	Severe: floods, wetness.	Moderate: floods, wetness.	Severe: wetness, floods.	Moderate: floods, wetness.	Severe: floods.
142, 142B Chaseburg	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.	Severe: floods.
143 Brady	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
152 Marshan	Severe: floods, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
159 Finchford	Severe: floods.	Slight	Slight	Slight	Moderate: droughty.
159C Finchford	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
160 Walford	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
162B Downs	Slight	Slight	Moderate: slope.	Slight	Slight.
162C, 162C2 Downs	Slight	Slight	Severe: slope.	Slight	Slight.
162D, 162D2 Downs	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
162E2 Downs	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
163B Fayette	Slight	Slight	Moderate: slope.	Slight	Slight.
163C, 163C2 Fayette	Slight	Slight	Severe: slope.	Slight	Slight.
163D2, 163D3 Fayette	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
163E2, 163E3, 163F2, 163F3: Fayette	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
163G, 163G3: Fayette	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
175: Dickinson	Slight	Slight	Slight	Slight	Slight.
175B: Dickinson	Slight	Slight	Moderate: slope.	Slight	Slight.
175C: Dickinson	Slight	Slight	Severe: slope.	Slight	Slight.
175D: Dickinson	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
177: Saude	Slight	Slight	Slight	Slight	Slight.
177B: Saude	Slight	Slight	Moderate: slope.	Slight	Slight.
177C: Saude	Slight	Slight	Severe: slope.	Slight	Slight.
178: Waukee	Slight	Slight	Slight	Slight	Slight.
178B: Waukee	Slight	Slight	Moderate: slope.	Slight	Slight.
179D2: Gara	Moderate: percs slowly, slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
184: Klinger	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness.	Slight	Moderate: wetness.
213B, 214B: Rockton	Slight	Slight	Moderate: depth to rock, slope.	Slight	Moderate: thin layer.
214C: Rockton	Slight	Slight	Severe: slope.	Slight	Moderate: thin layer.
216B: Ripon	Slight	Slight	Moderate: depth to rock, slope.	Slight	Moderate: thin layer.
216C: Ripon	Slight	Slight	Severe: slope.	Slight	Moderate: thin layer.
217B: Ripon	Slight	Slight	Moderate: depth to rock, slope.	Slight	Moderate: thin layer.
217C: Ripon	Slight	Slight	Severe: slope.	Slight	Moderate: thin layer.
221: Palms	Severe: ponding, floods, excess humus.	Severe: ponding, excess humus.	Severe: ponding, floods, excess humus.	Severe: ponding, excess humus.	Severe: ponding, floods, excess humus.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
226 Lawler	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Slight	Slight.
249, 249B Zwingle	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
284B Flagler	Slight	Slight	Moderate: slope.	Slight	Slight.
284C Flagler	Slight	Slight	Severe: slope.	Slight	Slight.
285B Burkhardt	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
285D Burkhardt	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
285F2 Burkhardt	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
291 Atterberry	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
293E*:					
Chelsea	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope, droughty.
Lamont	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Fayette	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
315*: Fluvents.					
Ambraw	Severe: floods, wetness.	Severe: wetness.	Severe: wetness, floods.	Severe: wetness.	Severe: wetness, floods.
350 Waukegan	Slight	Slight	Slight	Slight	Slight.
350B Waukegan	Slight	Slight	Moderate: slope.	Slight	Slight.
350C Waukegan	Slight	Slight	Severe: slope.	Slight	Slight.
351 Atterberry	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Slight	Slight.
352B Whittier	Slight	Slight	Moderate: slope.	Slight	Slight.
353 Tell	Slight	Slight	Slight	Severe: erodes easily.	Slight.
353B Tell	Slight	Slight	Moderate: slope.	Severe: erodes easily.	Slight.
353C Tell	Slight	Slight	Severe: slope.	Severe: erodes easily.	Slight.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
354*. Aquolls					
373E2 Timula	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
377B Dinsdale	Slight	Slight	Moderate: slope.	Slight	Slight.
377C Dinsdale	Slight	Slight	Severe: slope.	Slight	Slight.
382 Maxfield	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
399 Readlyn	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness.	Slight	Slight.
404 Thorp	Severe: floods, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, erodes easily.	Severe: wetness.
407B Schley	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness.	Slight	Slight.
408B Olin	Slight	Slight	Moderate: slope.	Slight	Slight.
409B Dickinson	Slight	Slight	Moderate: slope.	Slight	Slight.
412D Sogn	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Slight	Severe: thin layer.
420 Tama	Slight	Slight	Slight	Slight	Slight.
420B Tama	Slight	Slight	Moderate: slope.	Slight	Slight.
426B Aredale	Slight	Slight	Moderate: slope.	Slight	Slight.
428B Ely	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness.	Slight	Slight.
462 Downs	Slight	Slight	Slight	Slight	Slight.
462B Downs	Slight	Slight	Moderate: slope.	Slight	Slight.
462C Downs	Slight	Slight	Severe: slope.	Slight	Slight.
463B Fayette	Slight	Slight	Moderate: slope.	Slight	Slight.
478G*: Rock outcrop.					
Nordness	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, thin layer.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
499D: Nordness	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Slight	Severe: thin layer.
499F: Nordness	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Moderate: slope.	Severe: slope, thin layer.
591B*:					
Clyde	Severe: floods, wetness.	Moderate: floods, wetness.	Severe: floods, wetness.	Moderate: wetness, floods.	Severe: floods.
Schley	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness.	Slight	Slight.
662C2: Mt. Carroll	Slight	Slight	Severe: slope.	Slight	Slight.
662D2: Mt. Carroll	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
662E2: Mt. Carroll	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
688: Koszta	Severe: floods.	Moderate: wetness.	Moderate: wetness.	Slight	Slight.
727, 728: Udolpho	Moderate: wetness.	Moderate: wetness.	Severe: wetness.	Severe: erodes easily.	Moderate: wetness.
733: Calco	Severe: floods, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: floods, wetness.
760: Ansgar	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
777B: Wapsie	Slight	Slight	Moderate: slope.	Slight	Slight.
777C: Wapsie	Slight	Slight	Severe: slope.	Slight	Slight.
809B: Bertram	Slight	Slight	Moderate: slope, depth to rock.	Slight	Moderate: thin layer.
918: Garwin	Severe: wetness.	Moderate: wetness, too clayey.	Severe: wetness.	Moderate: wetness, too clayey.	Moderate: wetness.
919: Muscatine	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Slight	Slight.
920: Tama	Slight	Slight	Slight	Slight	Slight.
920B: Tama	Slight	Slight	Moderate: slope.	Slight	Slight.
923: Coyne	Slight	Slight	Slight	Slight	Slight.
933: Sawmill	Severe: floods, wetness.	Severe: wetness.	Severe: wetness, floods.	Severe: wetness.	Severe: wetness, floods.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
949 Zwingle Variant	Severe: ponding, too clayey, percs slowly.	Severe: ponding, percs slowly, too clayey.	Severe: ponding, percs slowly, too clayey.	Severe: ponding, too clayey.	Severe: too clayey, ponding.
951F Medary	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
953 Darwin Variant	Severe: wetness, too clayey, floods.	Severe: wetness, too clayey, percs slowly.	Severe: too clayey, wetness, percs slowly.	Severe: wetness, too clayey.	Severe: wetness, too clayey.
960 Shaffton	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.	Severe: floods.
961 Ambraw	Severe: floods, wetness.	Severe: wetness.	Severe: wetness, floods.	Severe: wetness.	Severe: wetness, floods.
962 Elvira	Severe: floods, wetness.	Moderate: wetness, floods.	Severe: floods, wetness.	Moderate: wetness, floods.	Severe: floods.
963 Elvers	Severe: floods, wetness.	Severe: wetness.	Severe: wetness, floods.	Severe: wetness.	Severe: wetness, floods.
976 Raddle	Slight	Slight	Slight	Slight	Slight.
1118 Garwin	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
1119 Muscatine	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness.	Slight	Slight.
1142 Chaseburg	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.	Severe: floods.
1160 Walford	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
1291 Atterberry	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
1777 Wapsie Variant	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.	Severe: floods.
1954 Darwin	Severe: floods, wetness, percs slowly.	Severe: wetness, too clayey, percs slowly.	Severe: too clayey, wetness, floods.	Severe: wetness, too clayey.	Severe: wetness, floods, too clayey.
5010*, 5030*. Pits					
5040*. Orthents					

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--WILDLIFE HABITAT POTENTIALS

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
11B*:										
Colo	Good	Fair	Good	Fair	Poor	Fair	Very poor.	Fair	Fair	Poor.
Ely	Good	Good	Good	Good	Good	Fair	Very poor.	Good	Good	Poor.
41B Sparta	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
41C, 41E Sparta	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
42 Granby	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
51 Vesser	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
54 Zook	Good	Fair	Good	Fair	Poor	Good	Good	Fair	Fair	Good.
63C Chelsea	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
63E, 63G Chelsea	Very poor.	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
65E2, 65E3, 65F2, 65F3 Lindley	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
65G, 65G3 Lindley	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
83B Kenyon	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
83C, 83C2 Kenyon	Fair	Good	Good	Good	Good	Poor	Fair	Good	Good	Fair.
84 Clyde	Good	Good	Good	Fair	Poor	Good	Good	Good	Fair	Good.
88 Nevin	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
110C Lamont	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
118 Garwin	Good	Good	Good	Fair	Poor	Good	Good	Good	Fair	Good.
119 Muscatine	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
120, 120B Tama	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
120C, 120C2, 120D, 120D2 Tama	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.

See footnote at end of table.

TABLE 10.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
133, 133+: Colo	Good	Fair	Good	Fair	Poor	Good	Good	Fair	Fair	Good.
142, 142B: Chaseburg	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
143: Brady	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
152: Marshan	Fair	Fair	Poor	Poor	Poor	Good	Good	Fair	Poor	Good.
159, 159C: Finchford	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
160: Walford	Fair	Fair	Fair	Poor	Poor	Good	Good	Fair	Poor	Good.
162B: Downs	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
162C, 162C2, 162D, 162D2: Downs	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
162E2: Downs	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
163B: Fayette	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
163C, 163C2, 163D2, 163D3: Fayette	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
163E2, 163E3, 163F2, 163F3: Fayette	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
163G, 163G3: Fayette	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Very poor.	Good	Very poor.
175, 175B: Dickinson	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
175C, 175D: Dickinson	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
177, 177B: Saude	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
177C: Saude	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
178, 178B: Waukee	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
179D2: Gara	Fair	Good	Fair	Good	Good	Very poor.	Poor	Fair	Good	Poor.
184: Klinger	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
213B, 214B, 214C: Rockton	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.

See footnote at end of table.

TABLE 10.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
216B Ripon	Good	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
216C Ripon	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
217B Ripon	Good	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
217C Ripon	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
221 Palms	Good	Poor	Poor	Poor	Poor	Good	Good	Fair	Poor	Poor.
226 Lawler	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
249, 249B Zwingle	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
284B Flagler	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
284C Flagler	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
285B, 285D Burkhardt	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
285F2 Burkhardt	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
291 Atterberry	Fair	Good	Good	Good	Good	Fair	Poor	Good	Good	Poor.
293E*:										
Chelsea	Very poor.	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Lamont	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Fayette	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
315*:										
Fluvents.										
Ambraw	Good	Fair	Good	Good	Fair	Good	Good	Good	Good	Good.
350, 350B Waukegan	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
350C Waukegan	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
351 Atterberry	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
352B Whittier	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
353, 353B Tell	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.

See footnote at end of table.

TABLE 10.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba-ceous plants	Hardwood trees	Conif-erous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
353C Tell	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
354*. Aquolls										
373E2 Timula	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
377B Dinsdale	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
377C Dinsdale	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
382 Maxfield	Good	Good	Good	Fair	Poor	Good	Good	Good	Fair	Good.
399 Readlyn	Good	Good	Good	Fair	Fair	Fair	Fair	Good	Fair	Fair.
404 Thorp	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good.
407B Schley	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good.
408B Olin	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
409B Dickinson	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Very poor.
412D Sogn	Very poor.	Very poor.	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.
420, 420B Tama	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
426B Aredale	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
428B Ely	Good	Good	Good	Good	Good	Fair	Very poor.	Good	Good	Poor.
462, 462B Downs	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
462C Downs	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
463B Fayette	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
478G*: Rock outcrop.										
Nordness	Very poor.	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
499D Nordness	Poor	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
499F Nordness	Very poor.	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.

See footnote at end of table.

TABLE 10.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
591B*:										
Clyde	Good	Good	Good	Fair	Poor	Good	Good	Good	Fair	Good.
Schley	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good.
662C2, 662D2 Mt. Carroll	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
662E2 Mt. Carroll	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
688 Koszta	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
727, 728 Udolpho	Good	Good	Good	Good	Fair	Good	Good	Good	Good	Good.
733 Calco	Good	Fair	Good	Poor	Very poor.	Good	Good	Fair	Poor	Fair.
760 Ansgar	Fair	Fair	Fair	Poor	Poor	Good	Good	Fair	Poor	Good.
777B Wapsie	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
777C Wapsie	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
809B Bertram	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
918 Garwin	Good	Good	Good	Fair	Poor	Good	Good	Good	Fair	Good.
919 Muscatine	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
920, 920B Tama	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
923 Coyne	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
933 Sawmill	Good	Good	Good	Fair	Fair	Good	Fair	Good	Fair	Poor.
949 Zwingle Variant	Poor	Poor	Fair	Fair	Poor	Good	Good	Poor	Fair	Good.
951F Medary	Very poor.	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
953 Darwin Variant	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
960 Shaffton	Good	Good	Good	Good	Fair	Good	Good	Good	Good	Good.
961 Ambraw	Good	Fair	Good	Good	Fair	Good	Good	Good	Good	Good.
962 Elvira	Good	Good	Good	Fair	Poor	Good	Good	Good	Fair	Good.

See footnote at end of table.

TABLE 10.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba-ceous plants	Hardwood trees	Conif-erous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
963----------------- Elvers	Good	Good	Good	Good	Poor	Good	Good	Good	Good	Good.
976----------------- Raddle	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
1118---------------- Garwin	Good	Good	Good	Fair	Poor	Good	Good	Good	Fair	Good.
1119---------------- Muscatine	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
1142---------------- Chaseburg	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
1160---------------- Walford	Fair	Fair	Fair	Poor	Poor	Good	Good	Fair	Poor	Good.
1291---------------- Atterberry	Fair	Good	Good	Good	Good	Fair	Poor	Good	Good	Poor.
1777---------------- Wapsie Variant	Good	Fair	Fair	Good	Good	Poor	Good	Good	Good	Fair.
1954---------------- Darwin	Poor	Poor	Fair	Poor	Poor	Good	Good	Poor	Poor	Good.
5010*, 5030*. Pits										
5040*. Orthents										

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
11B*:						
Colo	Severe: wetness.	Severe: floods, shrink-swell, wetness.	Severe: floods, shrink-swell, wetness.	Severe: floods, shrink-swell, wetness.	Severe: floods, low strength, shrink-swell.	Severe: floods.
Ely	Severe: wetness.	Severe: low strength.	Severe: low strength, wetness.	Severe: low strength.	Severe: frost action, low strength.	Slight.
41B Sparta	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
41C Sparta	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
41E Sparta	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
42 Granby	Severe: wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.
51 Vesser	Severe: wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, low strength, frost action.	Moderate: wetness, floods.
54 Zook	Severe: wetness.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: floods, low strength.	Moderate: wetness, floods.
63C Chelsea	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
63E Chelsea	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope, droughty.
63G Chelsea	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
65E2, 65E3, 65F2, 65F3, 65G, 65G3 Lindley	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
83B Kenyon	Slight	Slight	Slight	Slight	Severe: low strength.	Slight.
83C, 83C2 Kenyon	Slight	Slight	Slight	Moderate: slope.	Severe: low strength.	Slight.
84 Clyde	Severe: wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: low strength, floods, frost action.	Severe: floods.
88 Nevin	Severe: wetness.	Severe: floods.	Severe: wetness, floods.	Severe: floods.	Severe: frost action, low strength.	Slight.
110C Lamont	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
118. Garwin	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: frost action, low strength.	Moderate: wetness.
119. Muscatine	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.	Slight.
120, 120B. Tama	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: frost action, low strength.	Slight.
120C, 120C2. Tama	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Severe: frost action, low strength.	Slight.
120D, 120D2. Tama	Moderate: slope.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: frost action, low strength.	Moderate: slope.
133. Colo	Severe: wetness.	Severe: floods, shrink-swell, wetness.	Severe: floods, shrink-swell, wetness.	Severe: floods, shrink-swell, wetness.	Severe: floods, low strength, shrink-swell.	Moderate: wetness, floods.
133+. Colo	Severe: wetness.	Severe: floods, shrink-swell, wetness.	Severe: floods, shrink-swell, wetness.	Severe: floods, shrink-swell, wetness.	Severe: floods, low strength, shrink-swell.	Severe: floods.
142, 142B. Chaseburg	Moderate: wetness.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
143. Brady	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
152. Marshan	Severe: cutbanks cave, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: wetness, floods, frost action.	Severe: wetness.
159. Finchford	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.	Moderate: droughty.
159C. Finchford	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
160. Walford	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell, low strength.	Severe: wetness.
162B. Downs	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: frost action, low strength.	Slight.
162C, 162C2. Downs	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Severe: frost action, low strength.	Slight.
162D, 162D2. Downs	Moderate: slope.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: frost action, low strength.	Moderate: slope.
162E2. Downs	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, frost action, low strength.	Severe: slope.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
163B Fayette	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: frost action, low strength.	Slight.
163C, 163C2 Fayette	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Severe: frost action, low strength.	Slight.
163D2, 163D3 Fayette	Moderate: slope.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: frost action, low strength.	Moderate: slope.
163E2, 163E3, 163F2, 163F3, 163G, 163G3 Fayette	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: frost action, low strength, slope.	Severe: slope.
175, 175B Dickinson	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Slight.
175C Dickinson	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.
175D Dickinson	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
177, 177B Saude	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: low strength.	Slight.
177C Saude	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: low strength.	Slight.
178, 178B Waukee	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: low strength.	Slight.
179D2 Gara	Moderate: slope.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
184 Klinger	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: frost action, low strength.	Moderate: wetness.
213B, 214B Rockton	Moderate: depth to rock.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Moderate: thin layer.
214C Rockton	Moderate: depth to rock.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Severe: low strength.	Moderate: thin layer.
216B Ripon	Severe: depth to rock.	Moderate: depth to rock, shrink-swell.	Severe: depth to rock.	Moderate: depth to rock, shrink-swell.	Severe: frost action, low strength.	Moderate: thin layer.
216C Ripon	Severe: depth to rock.	Moderate: depth to rock, shrink-swell.	Severe: depth to rock.	Moderate: depth to rock, slope, shrink-swell.	Severe: frost action, low strength.	Moderate: thin layer.
217B Ripon	Severe: depth to rock.	Moderate: depth to rock, shrink-swell.	Severe: depth to rock.	Moderate: depth to rock, shrink-swell.	Severe: frost action, low strength.	Moderate: thin layer.
217C Ripon	Severe: depth to rock.	Moderate: depth to rock, shrink-swell.	Severe: depth to rock.	Moderate: depth to rock, slope, shrink-swell.	Severe: frost action, low strength.	Moderate: thin layer.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
221 Palms	Severe: excess humus, ponding.	Severe: ponding, low strength, floods.	Severe: ponding, low strength, floods.	Severe: ponding, floods, low strength.	Severe: ponding, floods, low strength.	Severe: ponding, floods, excess humus.
226 Lawler	Severe: wetness, cutbanks cave.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Severe: frost action, low strength.	Slight.
249, 249B Zwingle	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell, low strength.	Moderate: wetness.
284B, 284C Flagler	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Slight.
285B Burkhardt	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
285D Burkhardt	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
285F2 Burkhardt	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
291 Atterberry	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
293E*:						
Chelsea	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope, droughty.
Lamont	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
Fayette	Moderate: slope.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: frost action, low strength.	Moderate: slope.
315*: Fluvents.						
Ambraw	Severe: wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: low strength, wetness, floods.	Severe: wetness, floods.
350, 350B Waukegan	Severe: cutbanks cave.	Slight	Slight	Slight	Severe: low strength.	Slight.
350C Waukegan	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Severe: low strength.	Slight.
351 Atterberry	Severe: cutbanks cave, wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.	Slight.
352B Whittier	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
353, 353B Tell	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
353C Tell	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
354*. Aquolls						
373E2 Timula	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, frost action.	Severe: slope.
377B Dinsdale	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: frost action, low strength.	Slight.
377C Dinsdale	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Severe: frost action, low strength.	Slight.
382 Maxfield	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, frost action, low strength.	Moderate: wetness.
399 Readlyn	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Severe: frost action, low strength.	Slight.
404 Thorp	Severe: cutbanks cave, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: low strength, wetness, floods.	Severe: wetness.
407B Schley	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Severe: frost action.	Slight.
408B Olin	Slight	Slight	Slight	Slight	Moderate: frost action.	Slight.
409B Dickinson	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Slight.
412D Sogn	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: thin layer.
420, 420B Tama	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: frost action, low strength.	Slight.
426B Aredale	Slight	Slight	Slight	Slight	Severe: low strength.	Slight.
428B Ely	Severe: wetness.	Severe: low strength.	Severe: low strength, wetness.	Severe: low strength.	Severe: frost action, low strength.	Slight.
462, 462B Downs	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: frost action, low strength.	Slight.
462C Downs	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Severe: frost action, low strength.	Slight.
463B Fayette	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: frost action, low strength.	Slight.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
478G*: Rock outcrop.						
Nordness	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, thin layer.
499D Nordness	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: thin layer.
499F Nordness	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, thin layer.
591B*: Clyde	Severe: wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: low strength, floods, frost action.	Severe: floods.
Schley	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Severe: frost action.	Slight.
662C2 Mt. Carroll	Moderate: cutbanks cave.	Slight	Slight	Moderate: slope.	Severe: low strength, frost action.	Slight.
662D2 Mt. Carroll	Moderate: cutbanks cave, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
662E2 Mt. Carroll	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
688 Koszta	Severe: wetness.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Severe: low strength, frost action.	Slight.
727, 728 Udolpho	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Severe: low strength, frost action.	Moderate: wetness.
733 Calco	Severe: wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: low strength, floods.	Moderate: floods, wetness.
760 Ansgar	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, frost action, low strength.	Moderate: wetness.
777B Wapsie	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: low strength.	Slight.
777C Wapsie	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: low strength.	Slight.
809B Bertram	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: depth to rock.	Moderate: depth to rock, frost action.	Moderate: thin layer.
918 Garwin	Severe: wetness, cutbanks cave.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: frost action, shrink-swell, low strength.	Moderate: wetness.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
919 Muscatine	Severe: cutbanks cave, wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.	Slight.
920, 920B Tama	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
923 Coyne	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Slight.
933 Sawmill	Severe: wetness.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods, low strength.	Severe: wetness, floods.
949 Zwingle Variant	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: shrink-swell, ponding.	Severe: shrink-swell, ponding.	Severe: shrink-swell, ponding.	Severe: too clayey, ponding.
951F Medary	Severe: slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Severe: slope, too clayey.
953 Darwin Variant	Severe: depth to rock, wetness.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, depth to rock.	Severe: floods, wetness, shrink-swell.	Severe: wetness, shrink-swell, low strength.	Severe: wetness, too clayey.
960 Shaffton	Severe: floods, cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
961 Ambraw	Severe: wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: low strength, wetness, floods.	Severe: wetness, floods.
962 Elvira	Severe: wetness, cutbanks cave.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: floods, low strength, frost action.	Severe: floods.
963 Elvers	Severe: excess humus, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: wetness, floods, frost action.	Severe: wetness, floods.
976 Raddle	Slight	Slight	Slight	Slight	Severe: frost action.	Slight.
1118 Garwin	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: frost action, low strength.	Moderate: wetness.
1119 Muscatine	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.	Slight.
1142 Chaseburg	Moderate: wetness.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
1160 Walford	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell, low strength.	Severe: wetness.
1291 Atterberry	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
1777--------------- Wapsie Variant	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
1954--------------- Darwin	Severe: wetness.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: low strength, wetness, floods.	Severe: wetness, floods, too clayey.
5010*, 5030*. Pits						
5040*. Orthents						

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
11B*:					
Colo	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Poor: wetness.
Ely	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: wetness.
41B Sparta	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
41C, 41E Sparta	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
42 Granby	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.
51 Vesser	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.
54 Zook	Severe: percs slowly, wetness, floods.	Severe: wetness, floods.	Severe: wetness, too clayey, floods.	Severe: wetness, floods.	Poor: too clayey, wetness.
63C, 63E Chelsea	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy, seepage.
63G Chelsea	Severe: slope, poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy, slope.	Severe: seepage, slope.	Poor: too sandy, slope, seepage.
65E2, 65E3, 65F2, 65F3, 65G, 65G3 Lindley	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
83B Kenyon	Moderate: percs slowly.	Moderate: slope, seepage.	Slight	Slight	Good.
83C, 83C2 Kenyon	Moderate: percs slowly.	Severe: slope.	Slight	Slight	Good.
84 Clyde	Severe: floods, wetness.	Severe: wetness, floods.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.
88 Nevin	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
110C Lamont	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Good.
118 Garwin	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
119: Muscatine	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: wetness.
120: Tama	Slight	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
120B: Tama	Slight	Moderate: slope, seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
120C, 120C2: Tama	Slight	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
120D, 120D2: Tama	Moderate: slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: slope, too clayey.
133, 133+: Colo	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Poor: wetness.
142, 142B: Chaseburg	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Good.
143: Brady	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: wetness.
152: Marshan	Severe: floods, wetness, poor filter.	Severe: seepage, floods, wetness.	Severe: floods, seepage, wetness.	Severe: floods, seepage, wetness.	Poor: seepage, too sandy, small stones.
159, 159C: Finchford	Severe: poor filter.	Severe: seepage.	Severe: too sandy, seepage.	Severe: seepage.	Poor: too sandy, seepage.
160: Walford	Severe: wetness, percs slowly.	Slight	Severe: wetness.	Severe: wetness.	Poor: wetness.
162B: Downs	Slight	Moderate: slope, seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
162C, 162C2: Downs	Slight	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
162D, 162D2: Downs	Moderate: slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: slope, too clayey.
162E2: Downs	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
163B: Fayette	Slight	Moderate: slope, seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
163C, 163C2: Fayette	Slight	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
163D2, 163D3: Fayette	Moderate: slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: slope, too clayey.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
163E2, 163E3, 163F2, 163F3, 163G, 163G3------- Fayette	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
175, 175B------------ Dickinson	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
175C, 175D------------ Dickinson	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
177, 177B------------ Saude	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy, seepage.
177C------------------ Saude	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy, seepage.
178, 178B------------ Waukee	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: too sandy, seepage.
179D2----------------- Gara	Severe: percs slowly.	Severe: slope.	Moderate: too clayey, slope.	Moderate: slope.	Fair: too clayey, slope.
184------------------- Klinger	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: wetness.
213B, 214B------------ Rockton	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
214C------------------ Rockton	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
216B------------------ Ripon	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
216C------------------ Ripon	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
217B------------------ Ripon	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
217C------------------ Ripon	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
221------------------- Palms	Severe: floods, subsides, ponding.	Severe: seepage, excess humus, ponding.	Severe: wetness, floods, excess humus.	Severe: wetness, floods, seepage.	Poor: wetness, excess humus.
226------------------- Lawler	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Good.
249------------------- Zwingle	Severe: percs slowly, wetness.	Slight------------	Severe: too clayey, wetness.	Severe: wetness.	Poor: wetness, too clayey.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
249B: Zwingle	Severe: percs slowly, wetness.	Moderate: slope.	Severe: too clayey, wetness.	Severe: wetness.	Poor: wetness, too clayey.
284B: Flagler	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy, seepage.
284C: Flagler	Severe: poor filter.	Severe: slope, seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy, seepage.
285B: Burkhardt	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
285D: Burkhardt	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
285F2: Burkhardt	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
291: Atterberry	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.
293E*:					
Chelsea	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy, seepage.
Lamont	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Fair: slope.
Fayette	Moderate: slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: slope, too clayey.
315*: Fluvents.					
Ambraw	Severe: floods, wetness, percs slowly.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.
350, 350B: Waukegan	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
350C: Waukegan	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
351: Atterberry	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness.	Fair: too clayey, wetness, thin layer.
352B: Whittier	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy, seepage.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
353, 353B. Tell	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
353C. Tell	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
354*. Aquolls					
373E2. Timula	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
377B. Dinsdale	Moderate: percs slowly.	Moderate: slope, seepage.	Slight	Slight	Good.
377C. Dinsdale	Moderate: percs slowly.	Severe: slope.	Slight	Slight	Good.
382. Maxfield	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
399. Readlyn	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: wetness.
404. Thorp	Severe: floods, wetness, percs slowly.	Severe: seepage, floods, wetness.	Severe: floods, seepage, wetness.	Severe: floods, wetness.	Poor: wetness.
407B. Schley	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: wetness.
408B. Olin	Slight	Moderate: slope, seepage.	Slight	Slight	Good.
409B. Dickinson	Severe: poor filter.	Severe: seepage.	Slight	Severe: seepage.	Good.
412D. Sogn	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
420. Tama	Slight	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
420B. Tama	Slight	Moderate: slope, seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
426B. Aredale	Slight	Severe: seepage.	Slight	Severe: seepage.	Good.
428B. Ely	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: wetness.
462. Downs	Slight	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
462B. Downs	Slight	Moderate: slope, seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
462C. Downs	Slight	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
463B: Fayette	Slight	Moderate: slope, seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
478G*: Rock outcrop.					
Nordness	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Poor: area reclaim, slope.
499D: Nordness	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
499F: Nordness	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Poor: area reclaim, slope.
591B*: Clyde	Severe: floods, wetness.	Severe: wetness, floods.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.
Schley	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: wetness.
662C2: Mt. Carroll	Slight	Severe: slope.	Slight	Slight	Good.
662D2: Mt. Carroll	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
662E2: Mt. Carroll	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
688: Koszta	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
727, 728: Udolpho	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, small stones.
733: Calco	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Poor: wetness.
760: Ansgar	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
777B: Wapsie	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: too sandy, seepage.
777C: Wapsie	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: too sandy, seepage.
809B: Bertram	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: seepage, depth to rock.	Poor: area reclaim, thin layer.
918: Garwin	Severe: wetness, poor filter.	Severe: wetness, seepage.	Severe: wetness, seepage.	Severe: wetness, seepage.	Poor: wetness.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
919 Muscatine	Severe: wetness.	Severe: wetness, seepage.	Severe: seepage, wetness.	Severe: seepage, wetness.	Fair: wetness, too clayey.
920, 920B Tama	Slight	Severe: seepage.	Severe: seepage.	Slight	Good.
923 Coyne	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: thin layer.
933 Sawmill	Severe: floods, wetness.	Severe: wetness.	Severe: wetness, floods.	Severe: wetness, floods.	Poor: wetness.
949 Zwingle Variant	Severe: ponding, percs slowly.	Slight	Severe: too clayey, ponding.	Severe: ponding.	Poor: too clayey, ponding.
951F Medary	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Severe: slope.	Poor: too clayey, hard to pack.
953 Darwin Variant	Severe: wetness, percs slowly, depth to rock.	Severe: depth to rock.	Severe: depth to rock, wetness, too clayey.	Severe: depth to rock, wetness.	Poor: thin layer, too clayey, wetness.
960 Shaffton	Severe: floods, wetness.	Severe: floods, wetness, seepage.	Severe: floods, wetness, seepage.	Severe: floods, wetness, seepage.	Good.
961 Ambraw	Severe: floods, wetness, percs slowly.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.
962 Elvira	Severe: floods, wetness, poor filter.	Severe: floods, wetness, seepage.	Severe: floods, wetness, seepage.	Severe: floods, wetness.	Poor: wetness.
963 Elvers	Severe: floods, wetness.	Severe: seepage, floods, excess humus.	Severe: floods, wetness.	Severe: floods, seepage, wetness.	Poor: wetness, thin layer.
976 Raddle	Slight	Moderate: seepage.	Slight	Slight	Good.
1118 Garwin	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
1119 Muscatine	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: wetness.
1142 Chaseburg	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Good.
1160 Walford	Severe: wetness, percs slowly.	Slight	Severe: wetness.	Severe: wetness.	Poor: wetness.
1291 Atterberry	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1777----------------- Wapsie Variant	Severe: floods, poor filter.	Severe: floods, seepage.	Severe: floods, seepage.	Severe: floods, seepage.	Poor: too sandy, seepage.
1954----------------- Darwin	Severe: floods, wetness, percs slowly.	Severe: floods, wetness.	Severe: floods, wetness, too clayey.	Severe: floods, wetness.	Poor: too clayey, hard to pack, wetness.
5010*, 5030*. Pits					
5040*. Orthents					

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
11B*:				
Colo	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Ely	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
41B, 41C Sparta	Good	Probable	Improbable: too sandy.	Fair: too sandy.
41E Sparta	Good	Probable	Improbable: too sandy.	Fair: slope, too sandy.
42 Granby	Poor: wetness.	Probable	Improbable: too sandy.	Fair: too sandy.
51 Vesser	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
54 Zook	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
63C Chelsea	Good	Probable	Improbable: too sandy.	Fair: too sandy.
63E Chelsea	Good	Probable	Improbable: too sandy.	Fair: too sandy, slope.
63G Chelsea	Fair: slope.	Probable	Improbable: too sandy.	Poor: slope.
65E2, 65E3, 65F2, 65F3 Lindley	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
65G, 65G3 Lindley	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
83B, 83C, 83C2 Kenyon	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
84 Clyde	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
88 Nevin	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
110C Lamont	Good	Probable	Improbable: too sandy.	Good.
118 Garwin	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Good.
119 Muscatine	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
120, 120B, 120C, 120C2 Tama	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
120D, 120D2 Tama	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
133, 133+ Colo	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
142, 142B Chaseburg	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Good.
143 Brady	Fair: wetness.	Probable	Probable	Poor: small stones.
152 Marshan	Poor: wetness.	Probable	Probable	Poor: area reclaim, wetness.
159, 159C Finchford	Good	Probable	Improbable: too sandy.	Fair: too sandy.
160 Walford	Poor: wetness, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
162B, 162C, 162C2 Downs	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
162D, 162D2 Downs	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
162E2 Downs	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
163B, 163C, 163C2 Fayette	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
163D2 Fayette	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope, thin layer.
163D3 Fayette	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
163E2, 163E3, 163F2, 163F3 Fayette	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
163G, 163G3 Fayette	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
175, 175B, 175C Dickinson	Good	Probable	Improbable: too sandy.	Good.
175D Dickinson	Good	Probable	Improbable: too sandy.	Fair: slope.
177, 177B, 177C Saude	Good	Probable	Probable	Good.
178, 178B Waukee	Good	Probable	Improbable: too sandy.	Good.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
179D2: Gara	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer, slope.
184: Klinger	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
213B, 214B, 214C: Rockton	Poor: low strength, thin layer, area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, thin layer.
216B, 216C, 217B, 217C: Ripon	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, thin layer.
221: Palms	Poor: wetness, low strength.	Improbable: excess humus, excess fines.	Improbable: excess humus, excess fines.	Poor: wetness, excess humus.
226: Lawler	Good	Probable	Probable	Good.
249, 249B: Zwingle	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
284B, 284C: Flagler	Good	Probable	Probable	Good.
285B, 285D: Burkhardt	Good	Probable	Probable	Poor: small stones, area reclaim.
285F2: Burkhardt	Fair: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
291: Atterberry	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
293E*:				
Chelsea	Good	Probable	Improbable: too sandy.	Fair: too sandy, slope.
Lamont	Good	Probable	Improbable: too sandy.	Fair: slope.
Fayette	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope, thin layer.
315*: Fluvents.				
Ambraw	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
350, 350B, 350C: Waukegan	Good	Probable	Improbable: too sandy.	Good.
351: Atterberry	Fair: wetness.	Probable	Improbable: too sandy.	Good.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
352B: Whittier	Good	Probable	Improbable: too sandy.	Good.
353, 353B, 353C: Tell	Good	Probable	Improbable: too sandy.	Fair: thin layer.
354*. Aquolls				
373E2: Timula	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
377B, 377C: Dinsdale	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
382: Maxfield	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
399: Readlyn	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
404: Thorp	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
407B: Schley	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
408B: Olin	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
409B: Dickinson	Fair: thin layer.	Improbable: thin layer.	Improbable: excess fines.	Good.
412D: Sogn	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
420, 420B: Tama	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
426B: Aredale	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
428B: Ely	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
462, 462B, 462C: Downs	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
463B: Fayette	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
478G*: Rock outcrop.				
Nordness	Poor: area reclaim, thin layer, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope.
499D: Nordness	Poor: area reclaim, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
499F: Nordness	Poor: area reclaim, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
591B*:				
Clyde	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Schley	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
662C2 Mt. Carroll	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
662D2 Mt. Carroll	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
662E2 Mt. Carroll	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
688 Koszta	Fair: wetness.	Probable	Improbable: excess fines.	Fair: thin layer.
727, 728 Udolpho	Fair: wetness.	Probable	Improbable: too sandy.	Poor: area reclaim.
733 Calco	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
760 Ansgar	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
777B, 777C Wapsie	Good	Probable	Improbable: too sandy.	Good.
809B Bertram	Poor: area reclaim, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim.
918 Garwin	Fair: wetness.	Probable	Improbable: too sandy.	Good.
919 Muscatine	Fair: wetness.	Probable	Improbable: too sandy.	Good.
920, 920B Tama	Poor: low strength.	Probable	Improbable: too sandy.	Good.
923 Coyne	Good	Probable	Probable	Good.
933 Sawmill	Poor: wetness, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
949 Zwingle Variant	Poor: wetness, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
951F Medary	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
953 Darwin Variant	Poor: low strength, wetness, area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
960 Shaffton	Good	Probable	Improbable: too sandy.	Good.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
961------------------- Ambraw	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
962------------------- Elvira	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
963------------------- Elvers	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
976------------------- Raddle	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
1118------------------ Garwin	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Good.
1119------------------ Muscatine	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
1142------------------ Chaseburg	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Good.
1160------------------ Walford	Poor: wetness, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
1291------------------ Atterberry	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
1777------------------ Wapsie Variant	Good-----------------	Probable-------------	Improbable: too sandy.	Fair: area reclaim.
1954------------------ Darwin	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
5010*, 5030*. Pits				
5040*. Orthents				

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
11B*:							
Colo	Moderate: seepage, slope.	Severe: wetness.	Moderate: slow refill.	Floods, frost action.	Wetness, slope, floods.	Wetness	Wetness.
Ely	Moderate: slope, seepage.	Moderate: wetness.	Moderate: deep to water, slow refill.	Slope, frost action.	Slope, wetness.	Erodes easily, wetness.	Erodes easily.
41B, 41C Sparta	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
41E Sparta	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Slope, too sandy, soil blowing.	Slope, droughty.
42 Granby	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Floods, cutbanks cave.	Wetness, floods.	Wetness, too sandy.	Wetness.
51 Vesser	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Floods, frost action.	Floods, frost action.	Wetness, erodes easily.	Erodes easily, wetness.
54 Zook	Slight	Severe: hard to pack, wetness.	Severe: slow refill.	Floods, percs slowly, frost action.	Floods, wetness, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
63C Chelsea	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
63E, 63G Chelsea	Severe: slope, seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Slope, too sandy, soil blowing.	Slope, droughty.
65E2, 65E3, 65F2, 65F3, 65G, 65G3 Lindley	Severe: slope.	Slight	Severe: no water.	Deep to water	Rooting depth, slope.	Slope	Slope, rooting depth.
83B, 83C, 83C2 Kenyon	Moderate: slope, seepage.	Slight	Severe: no water.	Deep to water	Slope	Favorable	Favorable.
84 Clyde	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Frost action, floods.	Wetness, floods.	Wetness	Wetness, erodes easily.
88 Nevin	Moderate: seepage.	Moderate: wetness.	Moderate: deep to water, slow refill.	Frost action	Wetness	Erodes easily, wetness.	Erodes easily.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
110C: Lamont	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Slope, soil blowing.	Too sandy, soil blowing.	Favorable.
118: Garwin	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Frost action	Wetness	Wetness	Wetness.
119: Muscatine	Moderate: seepage.	Moderate: wetness.	Moderate: deep to water, slow refill.	Frost action	Wetness	Wetness, erodes easily.	Erodes easily.
120: Tama	Moderate: seepage.	Slight	Severe: no water.	Deep to water	Favorable	Erodes easily	Erodes easily.
120B, 120C, 120C2: Tama	Moderate: slope, seepage.	Slight	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.
120D, 120D2: Tama	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope	Erodes easily, slope.	Slope, erodes easily.
133, 133+: Colo	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Floods, frost action.	Floods, wetness.	Wetness	Wetness.
142, 142B: Chaseburg	Moderate: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Deep to water	Floods	Erodes easily	Erodes easily.
143: Brady	Severe: seepage.	Severe: piping, wetness.	Severe: cutbanks cave.	Frost action	Wetness, soil blowing.	Wetness, soil blowing.	Wetness.
152: Marshan	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Floods, frost action, cutbanks cave.	Wetness, floods.	Wetness, too sandy.	Wetness.
159, 159C: Finchford	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
160: Walford	Slight	Severe: wetness.	Severe: slow refill.	Percs slowly, frost action.	Wetness, percs slowly.	Wetness, erodes easily, percs slowly.	Wetness, percs slowly, erodes easily.
162B, 162C, 162C2: Downs	Moderate: slope, seepage.	Slight	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.
162D, 162D2, 162E2: Downs	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
163B, 163C, 163C2- Fayette	Moderate: slope, seepage.	Slight	Severe: no water.	Deep to water	Slope, erodes easily.	Favorable	Erodes easily.
163D2, 163D3, 163E2, 163E3, 163F2, 163F3, 163G, 163G3 Fayette	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope, erodes easily.	Slope	Slope, erodes easily.
175 Dickinson	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Soil blowing	Soil blowing, too sandy.	Favorable.
175B, 175C Dickinson	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Soil blowing, slope.	Soil blowing, too sandy.	Favorable.
175D Dickinson	Severe: slope, seepage.	Severe: seepage.	Severe: no water.	Deep to water	Soil blowing, slope.	Soil blowing, too sandy, slope.	Slope.
177 Saude	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Favorable	Too sandy	Favorable.
177B, 177C Saude	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Slope	Too sandy	Favorable.
178 Waukee	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Favorable	Too sandy	Favorable.
178B Waukee	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Slope	Too sandy	Favorable.
179D2 Gara	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope	Slope	Slope.
184 Klinger	Moderate: seepage.	Moderate: wetness.	Moderate: deep to water, slow refill.	Frost action	Wetness	Wetness, erodes easily.	Erodes easily.
213B, 214B, 214C Rockton	Moderate: slope, seepage, depth to rock.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, depth to rock.	Depth to rock	Depth to rock.
216B, 216C, 217B, 217C Ripon	Moderate: slope, depth to rock, seepage.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, depth to rock.	Depth to rock	Depth to rock.
221 Palms	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill.	Floods, frost action, subsides.	Ponding, soil blowing, floods.	Ponding, soil blowing.	Wetness.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
226: Lawler	Severe: seepage.	Severe: seepage.	Severe: cutbanks cave.	Frost action, cutbanks cave.	Wetness	Wetness, too sandy.	Favorable.
249: Zwingle	Slight	Severe: wetness.	Severe: slow refill.	Percs slowly	Percs slowly, wetness.	Erodes easily, wetness.	Wetness, erodes easily.
249B: Zwingle	Moderate: slope.	Severe: wetness.	Severe: slow refill.	Percs slowly, slope.	Wetness, percs slowly, slope.	Erodes easily, wetness.	Wetness, erodes easily.
284B, 284C: Flagler	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Soil blowing, slope.	Too sandy, soil blowing.	Favorable.
285B: Burkhardt	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Droughty, soil blowing, rooting depth.	Too sandy, soil blowing.	Droughty, rooting depth.
285D, 285F2: Burkhardt	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Droughty, soil blowing, rooting depth.	Slope, too sandy, soil blowing.	Slope, droughty, rooting depth.
291: Atterberry	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Frost action	Wetness	Erodes easily, wetness.	Wetness, erodes easily.
293E*:							
Chelsea	Severe: slope, seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Slope, too sandy, soil blowing.	Slope, droughty.
Lamont	Severe: slope, seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Slope, soil blowing.	Too sandy, soil blowing, slope.	Slope.
Fayette	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope, erodes easily.	Slope	Slope, erodes easily.
315*: Fluvents.							
Ambraw	Moderate: seepage.	Severe: wetness.	Severe: slow refill.	Floods, frost action.	Wetness, floods.	Wetness	Wetness.
350: Waukegan	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Favorable	Erodes easily, too sandy.	Erodes easily.
350B, 350C: Waukegan	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Slope	Erodes easily, too sandy.	Erodes easily.
351: Atterberry	Moderate: seepage.	Moderate: thin layer, wetness.	Severe: cutbanks cave.	Frost action	Wetness	Erodes easily, wetness.	Erodes easily.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
352B: Whittier	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope	Erodes easily, too sandy.	Erodes easily.
353: Tell	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily, too sandy.	Erodes easily.
353B, 353C: Tell	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Erodes easily, too sandy.	Erodes easily.
354*. Aquolls							
373E2: Timula	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
377B, 377C: Dinsdale	Moderate: slope, seepage.	Slight	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.
382: Maxfield	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Frost action	Wetness	Wetness	Wetness.
399: Readlyn	Moderate: seepage.	Moderate: wetness.	Moderate: deep to water, slow refill.	Frost action	Wetness	Wetness	Favorable.
404: Thorp	Moderate: seepage.	Severe: wetness.	Severe: slow refill, cutbanks cave.	Percs slowly, floods, frost action	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
407B: Schley	Moderate: seepage.	Moderate: wetness.	Moderate: deep to water, slow refill.	Frost action	Wetness	Wetness	Favorable.
408B: Olin	Moderate: slope, seepage.	Slight	Severe: no water.	Deep to water	Soil blowing, slope.	Soil blowing	Favorable.
409B: Dickinson	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Soil blowing, slope.	Too sandy, soil blowing.	Erodes easily.
412D: Sogn	Severe: depth to rock, slope.	Slight	Severe: no water.	Deep to water	Depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.
420: Tama	Moderate: seepage.	Slight	Severe: no water.	Deep to water	Favorable	Erodes easily	Erodes easily.
420B: Tama	Moderate: slope, seepage.	Slight	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
426B: Aredale	Severe: seepage.	Slight	Severe: no water.	Deep to water	Slope	Favorable	Favorable.
428B: Ely	Moderate: slope, seepage.	Moderate: wetness.	Moderate: deep to water, slow refill.	Slope, frost action.	Slope, wetness.	Erodes easily, wetness.	Erodes easily.
462: Downs	Moderate: seepage.	Slight	Severe: no water.	Deep to water	Favorable	Erodes easily	Erodes easily.
462B, 462C: Downs	Moderate: slope, seepage.	Slight	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.
463B: Fayette	Moderate: slope, seepage.	Slight	Severe: no water.	Deep to water	Slope, erodes easily.	Favorable	Erodes easily.
478G*: Rock outcrop.							
Nordness	Severe: slope, depth to rock.	Severe: thin layer.	Severe: no water.	Deep to water	Droughty, slope, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, droughty.
499D, 499F: Nordness	Severe: slope, depth to rock.	Severe: thin layer.	Severe: no water.	Deep to water	Droughty, slope, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, droughty.
591B*: Clyde	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Frost action, floods.	Wetness, floods.	Wetness	Wetness, erodes easily.
Schley	Moderate: seepage.	Moderate: wetness.	Moderate: deep to water, slow refill.	Frost action	Wetness	Wetness	Favorable.
662C2: Mt. Carroll	Moderate: seepage, slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.
662D2, 662E2: Mt. Carroll	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
688: Koszta	Severe: seepage.	Moderate: wetness.	Moderate: deep to water, slow refill.	Frost action	Wetness	Wetness, erodes easily.	Erodes easily.
727, 728: Udolpho	Severe: seepage.	Severe: seepage, wetness.	Severe: cutbanks cave.	Frost action, cutbanks cave.	Wetness, erodes easily.	Erodes easily, wetness, too sandy.	Wetness, erodes easily.
733: Calco	Moderate: seepage.	Severe: wetness.	Severe: slow refill.	Floods, frost action.	Floods, wetness.	Wetness	Wetness.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Limitations for-- Embankments, dikes, and levees	Limitations for-- Aquifer-fed excavated ponds	Features affecting-- Drainage	Features affecting-- Irrigation	Features affecting-- Terraces and diversions	Features affecting-- Grassed waterways
760 Ansgar	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Frost action	Wetness	Wetness, erodes easily.	Wetness, erodes easily.
777B, 777C Wapsie	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Droughty, slope.	Too sandy	Droughty.
809B Bertram	Moderate: seepage, depth to rock, slope.	Moderate: thin layer.	Severe: no water.	Deep to water	Depth to rock, slope.	Depth to rock, soil blowing.	Depth to rock.
918 Garwin	Severe: seepage.	Severe: wetness.	Severe: cutbanks cave.	Frost action, cutbanks cave.	Wetness	Wetness, erodes easily.	Wetness, erodes easily.
919 Muscatine	Severe: seepage.	Moderate: wetness.	Severe: cutbanks cave.	Frost action, cutbanks cave.	Wetness	Wetness, erodes easily.	Erodes easily.
920 Tama	Moderate: seepage.	Severe: thin layer.	Severe: no water.	Not needed	Favorable	Erodes easily	Erodes easily.
920B Tama	Moderate: seepage, slope.	Severe: thin layer.	Severe: no water.	Not needed	Slope	Erodes easily	Erodes easily.
923 Coyne	Severe: seepage.	Moderate: thin layer.	Severe: no water.	Deep to water	Soil blowing	Soil blowing	Favorable.
933 Sawmill	Moderate: seepage.	Severe: wetness, piping.	Moderate: slow refill.	Floods, frost action.	Wetness, floods.	Wetness	Wetness.
949 Zwingle Variant	Slight	Severe: ponding.	Severe: no water.	Ponding, percs slowly.	Percs slowly, ponding.	Percs slowly, ponding.	Wetness, percs slowly.
951F Medary	Severe: slope.	Moderate: hard to pack.	Severe: no water.	Deep to water	Percs slowly, rooting depth, slope.	Slope, erodes easily, percs slowly.	Slope, erodes easily, rooting depth.
953 Darwin Variant	Moderate: depth to rock.	Severe: wetness, hard to pack.	Severe: depth to rock.	Depth to rock, percs slowly.	Depth to rock, wetness, slow intake.	Depth to rock, wetness, percs slowly.	Depth to rock, wetness, percs slowly.
960 Shaffton	Severe: seepage.	Severe: seepage, piping.	Moderate: deep to water.	Deep to water	Floods	Favorable	Favorable.
961 Ambraw	Moderate: seepage.	Severe: wetness.	Severe: slow refill.	Floods, frost action.	Wetness, floods.	Wetness	Wetness.
962 Elvira	Moderate: seepage.	Severe: wetness.	Severe: cutbanks cave.	Floods, frost action.	Floods, wetness.	Wetness, erodes easily.	Wetness, erodes easily.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
963 Elvers	Severe: seepage.	Severe: piping, wetness.	Severe: slow refill, cutbanks cave.	Floods, frost action.	Wetness, floods.	Wetness	Wetness.
976 Raddle	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Favorable	Erodes easily	Erodes easily.
1118 Garwin	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Frost action	Wetness	Wetness	Wetness.
1119 Muscatine	Moderate: seepage.	Moderate: wetness.	Moderate: deep to water, slow refill.	Frost action	Wetness	Wetness, erodes easily.	Erodes easily.
1142 Chaseburg	Moderate: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Deep to water	Floods	Erodes easily	Erodes easily.
1160 Walford	Slight	Severe: wetness.	Severe: slow refill.	Percs slowly, frost action.	Wetness, percs slowly.	Wetness, erodes easily, percs slowly.	Wetness, percs slowly, erodes easily.
1291 Atterberry	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Frost action	Wetness	Erodes easily, wetness.	Wetness, erodes easily.
1777 Wapsie Variant	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Floods, droughty.	Too sandy	Droughty.
1954 Darwin	Slight	Severe: hard to pack, wetness.	Severe: slow refill.	Percs slowly, floods.	Wetness, slow intake, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
5010*, 5030*. Pits							
5040*. Orthents							

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
11B*:											
Colo------------	0-38	Silty clay loam	CL, CH	A-7	0	100	100	90-100	90-100	40-60	15-30
	38-60	Silty clay loam, clay loam.	CL, CH	A-7	0	100	100	95-100	80-100	40-55	15-30
Ely-------------	0-9	Silt loam--------	CL, OL, OH, MH	A-7, A-6	0	100	100	95-100	95-100	30-55	10-25
	9-60	Silty clay loam	CL, ML	A-7, A-6	0	100	100	95-100	95-100	35-50	10-25
41B, 41C, 41E---- Sparta	0-19	Loamy fine sand	SM	A-2, A-4	0	85-100	85-100	50-95	15-50	---	NP**
	19-60	Loamy fine sand, fine sand, sand.	SP-SM, SM	A-2, A-3, A-4	0	85-100	85-100	50-95	5-50	---	NP
42--------------- Granby	0-10	Fine sandy loam	SM	A-2	0	100	100	60-70	20-35	---	NP
	10-60	Sand, fine sand, loamy sand.	SP, SP-SM, SM	A-3, A-2	0	100	95-100	50-75	0-20	---	NP
51--------------- Vesser	0-16	Silt loam--------	CL	A-6	0	100	100	98-100	95-100	30-40	10-20
	16-32	Silt loam--------	CL	A-6	0	100	100	98-100	95-100	30-40	10-20
	32-60	Silty clay loam	CL, CH	A-7	0	100	100	98-100	95-100	40-55	20-30
54--------------- Zook	0-44	Silty clay loam	CH, CL	A-7	0	100	100	95-100	95-100	45-65	20-35
	44-60	Silty clay, silty clay loam.	CH	A-7	0	100	100	95-100	95-100	60-85	35-55
63C, 63E, 63G---- Chelsea	0-12	Loamy fine sand	SM, SP-SM	A-2-4	0	100	100	65-80	10-35	---	NP
	12-60	Fine sand, sand, loamy sand.	SP, SM, SP-SM	A-3, A-2-4	0	100	100	65-80	3-15	---	NP
65E2------------- Lindley	0-6	Loam-------------	CL-ML, CL	A-4, A-6	0	95-100	90-100	85-95	50-65	15-30	5-15
	6-40	Clay loam, loam	CL	A-6, A-7	0	95-100	90-100	85-95	55-75	30-45	15-25
	40-60	Loam-------------	CL	A-6	0	95-100	90-100	85-95	50-70	30-40	15-25
65E3------------- Lindley	0-6	Clay loam--------	CL	A-6	0	95-100	90-100	85-95	55-75	30-40	10-20
	6-40	Clay loam, loam	CL	A-6, A-7	0	95-100	90-100	85-95	55-75	30-45	15-25
	40-60	Loam-------------	CL	A-6	0	95-100	90-100	85-95	50-70	30-40	15-25
65F2------------- Lindley	0-6	Loam-------------	CL-ML, CL	A-4, A-6	0	95-100	90-100	85-95	50-65	15-30	5-15
	6-40	Clay loam, loam	CL	A-6, A-7	0	95-100	90-100	85-95	55-75	30-45	15-25
	40-60	Loam-------------	CL	A-6	0	95-100	90-100	85-95	50-70	30-40	15-25
65F3------------- Lindley	0-6	Clay loam--------	CL	A-6	0	95-100	90-100	85-95	55-75	30-40	10-20
	6-40	Clay loam, loam	CL	A-6, A-7	0	95-100	90-100	85-95	55-75	30-45	15-25
	40-60	Loam-------------	CL	A-6	0	95-100	90-100	85-95	50-70	30-40	15-25
65G-------------- Lindley	0-6	Loam-------------	CL-ML, CL	A-4, A-6	0	95-100	90-100	85-95	50-65	15-30	5-15
	6-40	Clay loam, loam	CL	A-6, A-7	0	95-100	90-100	85-95	55-75	30-45	15-25
	40-60	Loam-------------	CL	A-6	0	95-100	90-100	85-95	50-70	30-40	15-25
65G3------------- Lindley	0-6	Clay loam--------	CL	A-6	0	95-100	90-100	85-95	55-75	30-40	10-20
	6-40	Clay loam, loam	CL	A-6, A-7	0	95-100	90-100	85-95	55-75	30-45	15-25
	40-60	Loam-------------	CL	A-6	0	95-100	90-100	85-95	50-70	30-40	15-25
83B, 83C, 83C2--- Kenyon	0-16	Loam-------------	CL	A-6	0	100	95-100	85-95	65-75	30-40	10-20
	16-44	Loam, clay loam	CL	A-6	0-5	90-95	85-95	80-90	50-65	30-40	10-20
	44-60	Loam-------------	CL	A-6	0-5	90-95	85-95	80-90	50-65	25-35	10-20
84--------------- Clyde	0-18	Silty clay loam	OL, MH, ML, OH	A-7	0	100	100	80-90	55-75	45-60	15-25
	18-43	Clay loam, loam	CL, ML	A-6, A-7	0	95-100	90-95	75-90	50-75	30-50	10-20
	43-60	Loam-------------	CL, SC	A-6	2-5	90-95	85-90	75-90	45-65	25-35	10-20
88--------------- Nevin	0-24	Silty clay loam	CL, OL	A-6, A-7	0	100	100	100	90-95	35-45	10-20
	24-58	Silty clay loam	CL	A-7	0	100	100	95-100	90-95	40-50	20-30
	58-60	Silt loam--------	CL	A-7, A-6	0	100	100	95-100	90-95	40-50	20-30

See footnotes at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
110C------------- Lamont	0-13	Fine sandy loam	SM-SC, SC	A-2, A-4	0	100	100	80-95	25-50	15-25	5-10
	13-30	Sandy loam, loam, sandy clay loam.	SM-SC, SC	A-2, A-4	0	100	100	85-95	30-50	20-30	5-10
	30-60	Loamy fine sand, loamy sand, sand.	SM, SP-SM	A-2, A-3	0	100	100	70-90	5-25	---	NP
118-------------- Garwin	0-18	Silty clay loam	CL, CH	A-7	0	100	100	100	95-100	45-55	20-30
	18-50	Silty clay loam	CH, CL	A-7	0	100	100	100	95-100	45-55	25-35
	50-60	Silt loam--------	CL	A-6	0	100	100	100	95-100	30-40	15-20
119-------------- Muscatine	0-15	Silt loam--------	CL, CL-ML	A-6, A-4	0	100	100	100	95-100	25-40	5-15
	15-54	Silty clay loam	CL	A-7	0	100	100	100	95-100	40-50	20-30
	54-60	Silt loam--------	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
120, 120B, 120C, 120C2, 120D, 120D2----------- Tama	0-8	Silt loam--------	ML, OL	A-6, A-7	0	100	100	100	95-100	35-50	10-20
	8-44	Silty clay loam	CL	A-7	0	100	100	100	95-100	40-50	15-25
	44-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
133-------------- Colo	0-38	Silty clay loam	CL, CH	A-7	0	100	100	90-100	90-100	40-60	15-30
	38-60	Silty clay loam, clay loam.	CL, CH	A-7	0	100	100	95-100	80-100	40-55	15-30
133+------------- Colo	0-18	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	95-100	95-100	25-40	5-15
	18-38	Silty clay loam	CL, CH	A-7	0	100	100	90-100	90-100	40-55	20-30
	38-60	Silty clay loam, clay loam.	CL, CH	A-7	0	100	100	95-100	80-100	40-55	15-30
142, 142B-------- Chaseburg	0-60	Silt loam--------	ML, CL-ML	A-4	0	100	100	90-100	85-100	<25	NP-5
143-------------- Brady	0-12	Sandy loam-------	SM, SM-SC	A-2, A-4	0-5	95-100	75-100	60-70	25-40	<25	NP-7
	12-25	Sandy loam, sandy clay loam.	SM, SC, SM-SC	A-2, A-4, A-6	0-5	95-100	75-95	60-80	25-45	15-35	NP-16
	25-35	Loamy sand, sandy loam.	SM	A-2	0-5	95-100	75-95	55-70	15-35	---	NP
	35-60	Stratified sand to gravel.	SP, SP-SM, GP, GP-GM	A-1, A-3, A-2-4	0-5	40-75	35-70	20-55	0-10	---	NP
152-------------- Marshan	0-17	Clay loam--------	CL	A-7, A-6	0	95-100	95-100	95-100	80-95	35-50	15-25
	17-38	Loam, sandy loam	CL, CL-ML, SM-SC, SC	A-6, A-4	0	95-100	75-100	70-90	40-75	25-40	5-15
	38-60	Coarse sand, gravelly coarse sand, sand.	SP, SW, SP-SM	A-1	0-3	65-95	45-95	20-45	2-5	---	NP
159, 159C-------- Finchford	0-31	Loamy sand-------	SP-SM, SM	A-2, A-3	0	85-95	70-80	50-60	5-15	---	NP
	31-60	Coarse sand, loamy sand.	SW-SM, SP-SM	A-1	0	80-90	60-70	25-40	5-10	---	NP
160-------------- Walford	0-9	Silt loam--------	CL	A-6	0	100	100	100	95-100	30-35	10-15
	9-19	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	100	95-100	25-35	5-15
	19-54	Silty clay loam	CL, CH	A-7	0	100	100	100	95-100	45-55	20-30
	54-60	Silt loam--------	CL	A-6	0	100	100	100	95-100	35-40	15-20
162B, 162C, 162C2, 162D, 162D2, 162E2---- Downs	0-12	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	100	95-100	25-35	5-15
	12-43	Silty clay loam, silt loam.	CL	A-7, A-6	0	100	100	100	95-100	35-45	15-25
	43-60	Silt loam--------	CL	A-6	0	100	100	100	95-100	30-40	10-20

See footnotes at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
163B, 163C, 163C2, 163D2---- Fayette	0-8	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	100	95-100	25-35	5-15
	8-56	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
	56-60	Silt loam--------	CL	A-6	0	100	100	100	95-100	30-40	10-20
163D3------------ Fayette	0-6	Silty clay loam	CL	A-7, A-6	0	100	100	100	95-100	35-45	15-25
	6-56	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
	56-60	Silt loam--------	CL	A-6	0	100	100	100	95-100	30-40	10-20
163E2------------ Fayette	0-8	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	100	95-100	25-35	5-15
	8-56	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
	56-60	Silt loam--------	CL	A-6	0	100	100	100	95-100	30-40	10-20
163E3------------ Fayette	0-6	Silty clay loam	CL	A-7, A-6	0	100	100	100	95-100	35-45	15-25
	6-56	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
	56-60	Silt loam--------	CL	A-6	0	100	100	100	95-100	30-40	10-20
163F2------------ Fayette	0-8	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	100	95-100	25-35	5-15
	8-56	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
	56-60	Silt loam--------	CL	A-6	0	100	100	100	95-100	30-40	10-20
163F3------------ Fayette	0-6	Silty clay loam	CL	A-7, A-6	0	100	100	100	95-100	35-45	15-25
	6-56	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
	56-60	Silt loam--------	CL	A-6	0	100	100	100	95-100	30-40	10-20
163G------------- Fayette	0-8	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	100	95-100	25-35	5-15
	8-56	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
	56-60	Silt loam--------	CL	A-6	0	100	100	100	95-100	30-40	10-20
163G3------------ Fayette	0-6	Silty clay loam	CL	A-7, A-6	0	100	100	100	95-100	35-45	15-25
	6-56	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
	56-60	Silt loam--------	CL	A-6	0	100	100	100	95-100	30-40	10-20
175, 175B, 175C, 175D------------ Dickinson	0-28	Fine sandy loam	SM, SC, SM-SC	A-4, A-2	0	100	100	85-95	30-50	15-30	NP-10
	28-35	Loamy sand, loamy fine sand, fine sand.	SM, SP-SM, SM-SC	A-2, A-3	0	100	100	80-95	5-20	10-20	NP-5
	35-60	Sand, loamy fine sand, loamy sand.	SM, SP-SM	A-3, A-2	0	100	100	70-90	5-20	---	NP
177, 177B, 177C-- Saude	0-18	Loam-------------	CL	A-6	0	100	90-100	70-90	50-75	25-35	10-15
	18-30	Loam, sandy loam	CL, SC, CL-ML, SM-SC	A-4, A-6	0-5	85-95	80-95	70-85	36-60	20-30	5-15
	30-60	Loamy sand, gravelly coarse sand, sand.	SW, SM, GP, GM	A-1	2-10	50-90	50-85	20-40	3-25	---	NP
178, 178B-------- Waukee	0-19	Loam-------------	CL	A-6	0	100	90-100	70-90	50-75	30-40	10-20
	19-37	Loam, sandy clay loam.	CL, SM-SC, SC, CL-ML	A-6, A-4	0-5	85-95	80-95	65-85	40-60	20-35	5-15
	37-60	Gravelly sand, loamy coarse sand.	SW, SM, SP-SM, SP	A-1	2-10	60-90	60-85	20-40	3-25	---	NP
179D2------------ Gara	0-7	Loam-------------	CL, CL-ML	A-4, A-6	0	95-100	85-95	75-85	55-70	20-30	5-15
	7-44	Clay loam--------	CL	A-6	0-5	90-95	85-95	70-85	55-75	30-40	15-25
	44-60	Loam, clay loam	CL	A-6, A-7	0-5	90-95	85-95	70-85	55-75	35-45	15-25

See footnotes at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
184-------------- Klinger	0-8	Silt loam--------	CL, ML	A-7	0	100	100	100	95-100	40-50	15-25
	8-31	Silty clay loam	CL	A-7	0	100	100	100	95-100	40-50	20-30
	31-60	Loam, clay loam	CL	A-6	0-5	90-95	85-90	75-85	55-65	25-35	10-20
213B------------ Rockton	0-14	Loam-------------	ML, CL-ML, CL	A-4	0	90-100	90-100	85-95	50-75	25-35	5-10
	14-34	Loam, sandy clay loam, clay loam.	CL, SC	A-6, A-7	0	90-100	90-100	75-90	45-70	30-45	10-20
	34	Weathered bedrock	---	---	---	---	---	---	---	---	---
214B, 214C------- Rockton	0-14	Loam-------------	ML, CL-ML, CL	A-4	0	90-100	90-100	85-95	50-75	25-35	5-10
	14-25	Loam, sandy clay loam, clay loam.	CL, SC	A-6, A-7	0	90-100	90-100	75-90	45-70	30-45	10-20
	25	Weathered bedrock	---	---	---	---	---	---	---	---	---
216B, 216C------- Ripon	0-13	Silt loam--------	ML, CL-ML, CL	A-4	0	100	100	90-100	70-90	20-30	3-10
	13-30	Silty clay loam, silt loam, clay.	CL	A-6	0	100	100	90-100	70-95	25-40	10-20
	30	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
217B, 217C------- Ripon	1-18	Silt loam--------	ML, CL-ML, CL	A-4	0	100	100	90-100	70-90	20-30	3-10
	18-34	Silty clay loam, silt loam.	CL	A-6	0	100	100	90-100	70-95	25-40	10-20
	34	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
221-------------- Palms	0-39	Sapric material	PT	---	---	---	---	---	---	---	---
	39-60	Clay loam, silty clay loam, fine sandy loam.	CL-ML, CL	A-4, A-6	0	85-100	80-100	70-95	50-90	25-40	5-20
226-------------- Lawler	0-17	Loam-------------	OL, CL, ML	A-6, A-7	0	100	90-100	70-90	55-75	35-45	10-20
	17-35	Loam, sandy clay loam.	CL, SC	A-6	0-5	85-95	80-95	70-85	45-65	25-40	10-20
	35-60	Stratified sandy loam to gravelly coarse sand.	SW, GP, SP, SW-SM	A-1	2-10	50-90	50-85	20-40	3-10	---	NP
249, 249B-------- Zwingle	0-10	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	100	95-100	25-35	5-15
	10-60	Silty clay, silty clay loam, clay.	CH	A-7	0	100	100	100	95-100	55-70	30-40
284B, 284C------- Flagler	0-19	Sandy loam-------	SC, SM-SC	A-2, A-4	0	95-100	90-95	60-70	25-40	15-25	5-10
	19-35	Sandy loam-------	SC, SM-SC	A-2, A-4	0	95-100	90-95	50-70	25-40	15-25	5-10
	35-60	Loamy sand, sand, gravelly sand.	SP-SM, SW, SP, SW-SM	A-1	0-5	70-90	70-85	20-40	3-12	---	NP
285B, 285D, 285F2----------- Burkhardt	0-14	Sandy loam-------	SM, SM-SC	A-2, A-4	0	95-100	95-100	60-70	25-40	<20	2-7
	14-23	Sandy loam, loamy sand.	SM, ML, SC, CL	A-2, A-4	0	95-100	85-100	60-95	25-60	15-30	2-10
	23-60	Sand and gravel	SP, SP-SM, GP, GP-GM	A-1	0	50-75	45-75	20-35	1-5	---	NP
291-------------- Atterberry	0-17	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	95-100	95-100	25-40	5-15
	17-44	Silty clay loam, silt loam.	CL, CH	A-7, A-6	0	100	100	95-100	95-100	35-55	20-30
	44-60	Silt loam--------	CL	A-6	0	100	100	95-100	95-100	30-40	10-20

See footnotes at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
293E*:											
Chelsea----------	0-6	Loamy fine sand	SM, SP-SM	A-2-4	0	100	100	65-80	10-35	---	NP
	6-60	Fine sand, sand, loamy sand.	SP, SM, SP-SM	A-3, A-2-4	0	100	100	65-80	3-15	---	NP
Lamont----------	0-9	Fine sandy loam	SM-SC, SC	A-2, A-4	0	100	100	80-95	25-50	15-25	5-10
	9-30	Fine sandy loam, loam, sandy clay loam.	SM-SC, SC	A-2, A-4	0	100	100	85-95	30-50	20-30	5-10
	30-60	Loamy fine sand, loamy sand, sand.	SM, SP-SM	A-2, A-3	0	100	100	70-90	5-25	---	NP
Fayette----------	0-8	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	100	95-100	25-35	5-15
	8-56	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
	56-60	Silt loam--------	CL	A-6	0	100	100	100	95-100	30-40	10-20
315*: Fluvents.											
Ambraw----------	0-22	Silty clay loam	ML	A-6, A-7	0	100	100	85-95	70-95	35-45	10-18
	22-47	Clay loam sandy clay loam.	ML	A-7, A-6	0	100	100	85-95	70-95	35-48	10-20
	47-60	Stratified silty clay loam to sandy loam.	SC, ML, CL, SM	A-6, A-4	0	100	90-100	80-90	40-80	12-40	NP-17
350, 350B, 350C-- Waukegan	0-15	Silt loam--------	ML	A-4	0	95-100	95-100	95-100	85-95	25-40	3-10
	15-35	Silt loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	95-100	95-100	95-100	85-95	25-40	5-15
	35-60	Sandy loam, loamy sand.	SP, SM, SP-SM	A-2	0	100	100	65-80	3-15	---	NP
351-------------- Atterberry	0-16	Silt loam--------	CL, CL-ML	A-6, A-4	0	100	100	100	95-100	25-40	5-15
	16-46	Silty clay loam	CL	A-7	0	100	100	100	95-100	40-50	20-30
	46-50	Sandy loam-------	SM-SC, SC	A-4	0	100	95-100	80-90	35-50	20-30	5-10
	50-60	Loamy sand, sand	SP-SM, SM, SM-SC	A-2, A-3	0	100	95-100	80-90	5-20	<20	NP-5
352B------------- Whittier	0-17	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	95-100	85-95	25-35	5-15
	17-31	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	90-95	35-45	15-25
	31-60	Loamy fine sand, fine sand, loamy sand.	SM, SM-SC, SP-SM	A-2, A-3	0	100	95-100	80-90	5-20	<20	NP-5
353, 353B, 353C-- Tell	0-11	Silt loam--------	ML, CL-ML, CL	A-4	0	100	100	90-100	85-95	20-30	3-10
	11-30	Silty clay loam, silt loam.	CL	A-6, A-4	0	100	100	90-100	85-95	25-40	8-20
	30-39	Loam, sandy loam, sandy clay loam.	CL, ML, SM, SC	A-4, A-6	0	100	90-100	60-95	35-75	10-29	2-13
	39-60	Sand, loamy sand	SM, SP-SM, SP	A-2, A-3	0	100	90-100	50-75	0-15	---	NP

See footnotes at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
354*. Aquolls											
373E2----------- Timula	0-60	Silt loam--------	ML, CL-ML, CL	A-4	0	100	100	95-100	85-100	26-35	5-10
377B, 377C------- Dinsdale	0-7	Silt loam--------	ML, CL, OL	A-6, A-7	0	100	100	100	95-100	30-50	10-20
	7-35	Silty clay loam	CL	A-7	0	100	100	100	95-100	40-50	15-25
	35-60	Loam, clay loam, sandy clay loam.	CL	A-6	0-5	90-95	85-90	75-85	55-65	25-35	10-20
382-------------- Maxfield	0-19	Silty clay loam	CL, CH	A-7	0	100	100	100	95-100	45-55	20-30
	19-36	Silty clay loam, silt loam.	CH, CL	A-7	0	100	100	100	95-100	45-55	25-35
	36-60	Loam, sandy loam	CL, CL-ML, SM-SC, SM	A-6, A-4	0-5	90-95	85-90	75-85	45-65	25-35	10-20
399-------------- Readlyn	0-14	Loam-------------	CL	A-6	0	100	100	85-95	55-75	30-40	15-25
	14-47	Loam, clay loam, sandy clay loam.	CL, SC	A-6	2-5	90-95	85-90	75-85	45-65	30-40	10-20
	47-60	Loam, sandy clay loam.	CL, SC	A-6	2-5	90-95	85-90	75-85	45-65	25-35	10-20
404-------------- Thorp	0-22	Silt loam--------	CL, CL-ML	A-6, A-4	0	95-100	95-100	90-100	75-95	20-40	7-19
	22-41	Silty clay loam	CL	A-7, A-6	0	95-100	95-100	90-100	75-95	35-50	13-27
	41-46	Silt loam, clay loam, sandy clay loam.	CL	A-6, A-4, A-7	0	90-100	90-100	90-100	70-90	20-50	8-26
	46-60	Sandy loam, silt loam.	SM, ML, CL-ML, SM-SC	A-2, A-4	0	85-100	75-95	65-85	20-60	<20	NP-6
407B------------- Schley	0-14	Loam-------------	CL, CL-ML	A-4, A-6	0	100	95-100	80-90	55-75	25-40	5-15
	14-44	Loam, loamy sand, silty clay loam.	CL, SC, SM-SC, CL-ML	A-2, A-4	2-8	90-95	70-80	50-70	20-60	20-30	5-10
	44-60	Loam, sandy clay loam, clay loam.	CL	A-6	2-5	90-95	85-95	70-85	50-65	25-40	10-20
408B------------- Olin	0-25	Fine sandy loam	SM-SC, SC	A-2, A-4	0	100	95-100	85-95	30-50	20-30	5-10
	25-34	Loam, clay loam, sandy clay loam.	CL, SC	A-6	2-5	90-95	85-95	80-90	45-65	25-35	10-20
	34-60	Loam, sandy clay loam.	CL	A-6	2-5	90-95	85-95	80-90	50-65	25-35	10-20
409B------------- Dickinson	0-19	Fine sandy loam	SM, SC, SM-SC	A-2, A-4	0	100	100	80-95	30-50	15-30	NP-10
	19-45	Fine sandy loam, sandy loam, loamy sand.	SM, SP, SM-SC	A-2, A-3	0	100	100	80-95	3-20	10-20	NP-5
	45-60	Loam-------------	CL	A-6	2-5	90-95	85-95	80-90	55-65	25-35	11-20
412D------------- Sogn	0-13	Loam-------------	CL	A-6	0-10	85-100	85-100	85-100	70-95	25-40	11-23
	13	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
420, 420B-------- Tama	0-19	Silt loam--------	ML, OL	A-6, A-7	0	100	100	100	95-100	35-50	10-20
	19-44	Silty clay loam	CL	A-7	0	100	100	100	95-100	40-50	15-25
	44-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
426B------------- Aredale	0-17	Loam-------------	CL, CL-ML	A-4, A-6	0	100	95-100	85-95	55-75	25-35	5-15
	17-42	Loam, clay loam	CL, SC	A-6	2-5	90-95	85-95	80-90	40-60	30-40	10-20
	42-60	Loam-------------	CL	A-6	2-5	90-95	85-95	80-90	50-65	25-35	11-20
428B------------- Ely	0-9	Silt loam--------	CL, OL, OH, MH	A-7, A-6	0	100	100	95-100	95-100	30-55	10-25
	9-60	Silty clay loam	CL, ML	A-7, A-6	0	100	100	95-100	95-100	35-50	10-25

See footnotes at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag-ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct					Pct	
462, 462B, 462C--Downs	0-12	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	100	95-100	25-35	5-15
	12-43	Silty clay loam, silt loam.	CL	A-7, A-6	0	100	100	100	95-100	35-45	15-25
	43-60	Silt loam--------	CL	A-6	0	100	100	100	95-100	30-40	10-20
463B-------------Fayette	0-8	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	100	95-100	25-35	5-15
	8-56	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
	56-60	Silt loam--------	CL	A-6	0	100	100	100	95-100	30-40	10-20
478G*: Rock outcrop.											
Nordness--------	0-7	Silt loam--------	CL, CL-ML	A-4	0	100	100	90-100	70-90	20-30	5-10
	7-15	Silty clay loam, clay loam.	CL, CH	A-7	2-10	85-95	80-90	70-85	65-85	45-60	30-40
	15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
499D, 499F-------Nordness	0-7	Silt loam--------	CL, CL-ML	A-4	0	100	100	90-100	70-90	20-30	5-10
	7-15	Silty clay loam, clay loam.	CL, CH	A-7	2-10	85-95	80-90	70-85	65-85	45-60	30-40
	15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
591B*: Clyde-----------	0-18	Silty clay loam	OL, MH, ML, OH	A-7	0	100	100	80-90	55-75	45-60	15-25
	18-43	Clay loam, loam	CL, ML	A-6, A-7	0	95-100	90-95	75-90	50-75	30-50	10-20
	43-60	Loam-------------	CL, SC	A-6	2-5	90-95	85-90	75-90	45-65	25-35	10-20
Schley----------	0-14	Loam-------------	CL, CL-ML	A-4, A-6	0	100	95-100	80-90	55-75	25-40	5-15
	14-44	Loam, sandy loam, silty clay loam.	CL, SC, SM-SC, CL-ML	A-2, A-4	2-8	90-95	70-80	50-70	20-60	20-30	5-10
	44-60	Loam, sandy clay loam, clay loam.	CL	A-6	2-5	90-95	85-95	70-85	50-65	25-40	10-20
662C2, 662D2, 662E2-----------Mt. Carroll	0-8	Silt loam--------	CL	A-4, A-6	0	100	100	100	95-100	25-36	7-18
	8-55	Silt loam--------	CL	A-6, A-4	0	100	100	100	95-100	27-40	8-20
	55-60	Silt loam, silt	CL	A-4, A-6	0	100	100	100	90-100	26-37	7-17
688--------------Koszta	0-14	Silt loam--------	CL	A-6	0	100	100	95-100	95-100	30-40	10-20
	14-45	Silty clay loam	CL	A-7	0	100	100	95-100	95-100	40-50	20-30
	45-60	Silt loam--------	CL	A-6	0	100	100	100	95-100	30-40	10-20
727--------------Udolpho	0-15	Loam-------------	CL, ML	A-6, A-7	0	100	100	90-100	70-95	30-50	10-20
	15-36	Loam, sandy loam, clay loam.	CL, ML	A-6, A-7	0-2	95-100	85-100	80-95	60-85	30-50	10-20
	36-60	Coarse sand, sand, gravelly coarse sand.	SP, SM, SP-SM, SW	A-1	0-3	75-90	45-85	20-45	0-10	---	NP
728--------------Udolpho	0-15	Loam-------------	CL, ML	A-6, A-7	0	100	100	90-100	70-95	30-50	10-20
	15-30	Loam, sandy loam, clay loam.	CL, ML	A-6, A-7	0-2	95-100	85-100	80-95	60-85	30-50	10-20
	30-60	Loamy sand, sand, gravelly coarse sand.	SP, SM, SP-SM, SW	A-1	0-3	75-90	45-85	20-45	0-10	---	NP
733--------------Calco	0-19	Silty clay loam	ML, MH, CH, CL	A-7	0	100	100	95-100	85-100	40-60	15-30
	19-52	Silty clay loam, loam, clay loam.	CL	A-7, A-6	0	100	100	90-100	80-100	30-45	10-20
	52-60	Loamy sand-------	SM, SP-SM	A-2, A-3	0	100	100	70-90	5-25	---	NP
760--------------Ansgar	0-24	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	100	95-100	25-35	5-15
	24-39	Silty clay loam	CL	A-7	0	100	100	100	95-100	40-50	20-30
	39-60	Loam, sandy clay loam, clay loam.	CL	A-6	2-5	90-95	85-95	75-85	55-65	25-35	10-20

See footnotes at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
777B, 777C: Wapsie	0-18	Loam	CL, ML, CL-ML	A-4	0	100	90-100	70-90	50-75	25-35	5-10
	18-29	Loam, sandy clay loam.	CL, SC, CL-ML, SM-SC	A-4, A-6	0	85-95	80-95	70-85	40-60	20-35	5-15
	29-60	Sandy loam, gravelly loamy sand, sand.	SW, SM, SP, SP-SM	A-1	0	60-90	60-85	20-40	3-25	---	NP
809B: Bertram	0-28	Sandy loam	SM-SC, SC, SM	A-2, A-4	0	100	95-100	85-95	30-50	25-35	5-10
	28-33	Loamy sand	SP-SM, SM-SC, SM	A-2, A-3	0	100	95-100	80-90	5-20	<20	NP-5
	33	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
918: Garwin	0-15	Silty clay loam	CL, CH	A-7	0	100	100	100	95-100	40-55	20-30
	15-42	Silty clay loam	CL, CH	A-7	0	100	100	100	95-100	45-55	25-35
	42-46	Sandy loam, loam	SM-SC, SC	A-4	0	100	95-100	80-90	35-50	20-30	5-10
	46-60	Loamy sand, sand	SP-SM, SM, SM-SC	A-2, A-3	0	100	95-100	80-90	5-20	<20	NP-5
919: Muscatine	0-21	Silt loam	CL-ML, CL	A-4, A-6	0	100	100	100	95-100	25-40	5-15
	21-47	Silty clay loam	CL	A-7	0	100	100	100	95-100	40-50	20-30
	47-55	Sandy loam, loam	SM-SC, SC	A-4	0	100	95-100	80-90	35-50	20-30	5-10
	55-60	Loamy sand, sand	SP-SM, SM, SM-SC	A-2, A-3	0	100	95-100	80-90	5-20	<20	NP-5
920, 920B: Tama	0-22	Silt loam	CL-ML, CL	A-4, A-6	0	100	100	100	95-100	25-40	5-15
	22-41	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	100	95-100	35-50	15-25
	41-45	Sandy loam, loam	SM-SC, SC	A-4	0	100	95-100	80-90	35-50	20-30	5-10
	45-60	Loamy fine sand, loamy sand, fine sand.	SP-SM, SM, SM-SC	A-2, A-3	0	100	95-100	80-90	5-20	<20	NP-5
923: Coyne	0-21	Fine sandy loam	SC, SM-SC	A-2, A-4	0	100	95-100	60-70	20-40	20-30	5-10
	21-32	Loam	SC, SM-SC	A-2, A-4	0	100	95-100	60-70	20-40	20-30	5-10
	32-55	Silty clay loam, loam, silt loam.	CL	A-6	0	100	100	85-100	80-95	25-40	11-25
	55-60	Sand and gravel	SP, SM, SP-SM	A-1	0	70-90	60-80	20-45	0-15	<15	NP-3
933: Sawmill	0-37	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-100	30-50	15-30
	37-60	Loam, silt loam	CL	A-6	0	100	100	90-100	85-100	25-40	10-20
949: Zwingle Variant	0-7	Silty clay	CH	A7	0	100	100	100	95-100	55-70	30-40
	7-60	Clay, silty clay	CH	A7	0	100	100	100	95-100	60-85	40-60
951F: Medary	0-8	Silt loam	CL, CL-ML	A-4	0	100	100	90-100	60-75	20-30	5-10
	8-15	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	90-100	60-95	20-40	5-20
	15-60	Silty clay loam, silty clay, clay.	CL, CH	A-7	0	100	100	90-100	75-95	40-65	23-41
953: Darwin Variant	0-9	Silty clay	CH	A-7	0	100	100	100	95-100	60-85	35-55
	9-20	Clay	CH	A-7	0	100	100	100	95-100	60-85	35-55
	20	Weathered bedrock	---	---	---	---	---	---	---	---	---
960: Shaffton	0-13	Loam	CL	A-6	0	100	100	85-95	60-70	30-40	11-20
	13-36	Loam	CL, CL-ML	A-4, A-6	0	100	100	85-95	55-65	25-35	5-15
	36-39	Loamy sand, sandy loam.	SM, SM-SC, SP-SM	A-2	0	100	100	50-75	10-30	<15	NP-5
	39-45	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	80-95	35-45	15-25
	45-60	Coarse sand	SW	A-1	0	90-100	90-95	20-35	3-5	---	NP

See footnotes at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
961--------------- Ambraw	0-8	Silty clay loam	ML	A-6, A-7	0	100	100	85-95	70-95	35-45	10-18
	8-47	Loam, sandy loam	ML	A-6	0	100	100	85-95	70-95	35-48	10-20
	47-60	Loamy fine sand	SP, SP-SM	A-2, A-3	0	100	100	70-90	5-25	---	NP
962--------------- Elvira	0-15	Silty clay loam	CL, CH	A-7	0	95-100	90-95	90-95	85-95	45-55	20-30
	15-48	Silty clay loam, clay loam.	CL	A-7	0	95-100	90-95	85-95	80-90	40-50	15-25
	48-60	Stratified clay loam to loamy sand.	SM, SC, SM-SC	A-2, A-4, A-6	0	95-100	85-95	60-70	30-40	10-40	NP-20
963--------------- Elvers	0-35	Silt loam--------	ML, CL, CL-ML	A-4	0	100	100	90-100	70-90	20-30	3-10
	35-55	Sapric material	PT	A-8	0	---	---	---	---	---	---
	55-60	Silt loam, loam, sand.	ML, CL, SM, SC	A-2, A-3, A-4, A-6	0	80-100	80-100	50-100	5-90	<30	NP-15
976--------------- Raddle	0-19	Silt loam--------	CL	A-4, A-6	0	100	100	95-100	85-100	25-35	8-15
	19-60	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	80-100	20-30	4-14
1118-------------- Garwin	0-18	Silty clay loam	CL, CH	A-7	0	100	100	100	95-100	45-55	20-30
	18-50	Silty clay loam	CH, CL	A-7	0	100	100	100	95-100	45-55	25-35
	50-60	Silt loam--------	CL	A-6	0	100	100	100	95-100	30-40	15-20
1119-------------- Muscatine	0-19	Silt loam--------	CL, CL-ML	A-6, A-4	0	100	100	100	95-100	25-40	5-15
	19-54	Silty clay loam	CL	A-7	0	100	100	100	95-100	40-50	20-30
	54-60	Silt loam--------	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
1142-------------- Chaseburg	0-60	Silt loam--------	ML, CL-ML	A-4	0	100	100	90-100	85-100	<25	NP-5
1160-------------- Walford	0-9	Silt loam--------	CL	A-6	0	100	100	100	95-100	30-35	10-15
	9-19	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	100	95-100	25-35	5-15
	19-54	Silty clay loam	CL, CH	A-7	0	100	100	100	95-100	45-55	20-30
	54-60	Silt loam--------	CL	A-6	0	100	100	100	95-100	35-40	15-20
1291-------------- Atterberry	0-17	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	95-100	95-100	25-40	5-15
	17-44	Silty clay loam, silt loam.	CL, CH	A-7, A-6	0	100	100	95-100	95-100	35-55	20-30
	44-60	Silt loam--------	CL	A-6	0	100	100	95-100	95-100	30-40	10-20
1777-------------- Wapsie Variant	0-9	Loam-------------	CL-ML, CL, ML	A-4	0	100	95-100	70-90	50-75	25-35	5-10
	9-21	Loam, sandy loam	CL-ML, CL, SC	A-4	0	100	95-100	75-85	40-60	20-30	5-10
	21-60	Sand, loamy sand	SP, SP-SM	A-3, A-2	0	100	80-95	50-70	3-15	---	NP
1954-------------- Darwin	0-12	Silty clay-------	CH	A-7	0	100	100	100	95-100	50-85	30-55
	12-48	Silty clay, clay, silty clay loam.	CH	A-7	0	100	100	100	95-100	50-85	30-55
	48	Weathered bedrock	---	---	---	---	---	---	---	---	---
5010*, 5030*. Pits											
5040*. Orthents											

* See description of the map unit for composition and behavior characteristics of the map unit.
** NP means nonplastic.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group
	In	Pct	G/cm3	In/hr	In/in	pH				
11B*:										
Colo	0-38	27-32	1.28-1.32	0.6-2.0	0.21-0.23	5.6-7.3	High	0.28	5	7
	38-60	28-35	1.35-1.45	0.6-2.0	0.18-0.20	6.1-7.3	High	0.28		
Ely	0-9	25-30	1.30-1.35	0.6-2.0	0.21-0.23	5.6-7.3	Moderate	0.32	5	7
	9-60	28-32	1.30-1.40	0.6-2.0	0.18-0.20	5.6-7.3	Moderate	0.43		
41B, 41C, 41E Sparta	0-19	3-10	1.20-1.40	2.0-6.0	0.09-0.12	5.1-7.3	Low	0.17	5	2
	19-60	2-8	1.40-1.60	6.0-20	0.05-0.11	5.1-6.0	Low	0.17		
42 Granby	0-10	2-18	0.92-1.59	2.0-6.0	0.16-0.18	5.6-7.3	Low	0.17	5	3
	10-60	0-14	1.45-1.74	6.0-20	0.05-0.12	5.6-7.8	Low	0.17		
51 Vesser	0-16	20-26	1.30-1.35	0.6-2.0	0.20-0.24	5.6-7.3	Moderate	0.32	5	7
	16-32	16-22	1.35-1.40	0.6-2.0	0.18-0.22	5.1-6.5	Moderate	0.43		
	32-60	30-36	1.40-1.45	0.6-2.0	0.17-0.21	5.6-6.5	Moderate	0.43		
54 Zook	0-44	32-38	1.30-1.35	0.2-0.6	0.21-0.23	5.6-7.3	High	0.28	5	7
	44-60	36-45	1.30-1.45	0.06-0.2	0.11-0.13	5.6-7.8	High	0.28		
63C, 63E, 63G Chelsea	0-12	8-15	1.50-1.55	6.0-20	0.10-0.15	5.6-7.3	Low	0.17	5	2
	12-60	5-10	1.55-1.70	6.0-20	0.06-0.08	5.1-6.1	Low	0.17		
65E2 Lindley	0-6	18-27	1.20-1.40	0.6-2.0	0.16-0.18	4.5-7.3	Low	0.32	5	6
	6-40	25-35	1.50-1.75	0.2-0.6	0.14-0.18	4.5-6.5	Moderate	0.32		
	40-60	18-27	1.75-1.85	0.2-0.6	0.12-0.16	6.1-7.8	Moderate	0.32		
65E3 Lindley	0-6	27-35	1.30-1.40	0.2-0.6	0.14-0.18	4.5-6.0	Moderate	0.32	4	6
	6-40	25-35	1.50-1.75	0.2-0.6	0.14-0.18	4.5-6.5	Moderate	0.32		
	40-60	18-27	1.75-1.85	0.2-0.6	0.12-0.16	6.1-7.8	Moderate	0.32		
65F2 Lindley	0-6	18-27	1.20-1.40	0.6-2.0	0.16-0.18	4.5-6.0	Low	0.32	5	6
	6-40	25-35	1.50-1.75	0.2-0.6	0.14-0.18	4.5-6.5	Moderate	0.32		
	40-60	18-27	1.75-1.85	0.2-0.6	0.12-0.16	6.1-7.8	Moderate	0.32		
65F3 Lindley	0-6	27-35	1.30-1.40	0.2-0.6	0.14-0.18	4.5-6.0	Moderate	0.32	4	6
	6-40	25-35	1.50-1.75	0.2-0.6	0.14-0.18	4.5-6.5	Moderate	0.32		
	40-60	18-27	1.75-1.85	0.2-0.6	0.12-0.16	6.1-7.8	Moderate	0.32		
65G Lindley	0-6	18-27	1.20-1.40	0.6-2.0	0.16-0.18	4.5-6.0	Low	0.32	5	6
	6-40	25-35	1.50-1.75	0.2-0.6	0.14-0.18	4.5-6.5	Moderate	0.32		
	40-60	18-27	1.75-1.85	0.2-0.6	0.12-0.16	6.1-7.8	Moderate	0.32		
65G3 Lindley	0-6	27-35	1.30-1.40	0.2-0.6	0.14-0.18	4.5-6.0	Moderate	0.32	4	6
	6-40	25-35	1.50-1.75	0.2-0.6	0.14-0.18	4.5-6.5	Moderate	0.32		
	40-60	18-27	1.75-1.85	0.2-0.6	0.12-0.16	6.1-7.8	Moderate	0.32		
83B, 83C, 83C2 Kenyon	0-16	20-25	1.40-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Low	0.28	5	6
	16-44	20-28	1.45-1.65	0.6-2.0	0.17-0.19	5.1-7.3	Low	0.28		
	44-60	20-24	1.65-1.80	0.6-2.0	0.17-0.19	6.6-7.8	Low	0.37		
84 Clyde	0-18	28-32	1.40-1.45	0.6-2.0	0.21-0.23	6.6-7.3	Moderate	0.28	5	7
	18-43	22-28	1.45-1.65	0.6-2.0	0.18-0.20	6.6-7.3	Moderate	0.37		
	43-60	20-24	1.70-1.80	0.6-2.0	0.17-0.19	6.6-8.4	Moderate	0.37		
88 Nevin	0-24	26-29	1.30-1.35	0.6-2.0	0.21-0.23	5.6-7.3	Moderate	0.32	5	7
	24-58	30-35	1.30-1.40	0.6-2.0	0.18-0.20	6.1-6.5	Moderate	0.43		
	58-60	20-26	1.40-1.45	0.6-2.0	0.18-0.20	6.6-7.3	Moderate	0.43		
110C Lamont	0-13	10-15	1.50-1.55	2.0-6.0	0.16-0.18	5.1-7.3	Low	0.24	5	3
	13-30	10-22	1.45-1.65	2.0-6.0	0.14-0.16	5.1-6.0	Low	0.24		
	30-60	2-10	1.65-1.75	6.0-20	0.09-0.11	5.1-6.5	Low	0.17		

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group
	In	Pct	G/cm3	In/hr	In/in	pH				
118-------------- Garwin	0-18	30-35	1.30-1.35	0.6-2.0	0.21-0.23	5.6-7.3	High---------	0.28	5	7
	18-50	28-34	1.28-1.35	0.6-2.0	0.18-0.20	6.1-7.3	High---------	0.28		
	50-60	20-26	1.35-1.45	0.6-2.0	0.20-0.22	6.1-7.8	Moderate-----	0.28		
119-------------- Muscatine	0-15	24-27	1.28-1.32	0.6-2.0	0.22-0.24	5.1-7.3	Moderate-----	0.28	5	6
	15-54	30-34	1.28-1.35	0.6-2.0	0.18-0.20	5.1-7.3	Moderate-----	0.43		
	54-60	22-26	1.35-1.40	0.6-2.0	0.18-0.20	6.6-7.8	Moderate-----	0.43		
120, 120B, 120C, 120C2, 120D, 120D2----------- Tama	0-8	24-29	1.25-1.30	0.6-2.0	0.22-0.24	5.1-7.3	Moderate-----	0.32	5	7
	8-44	28-34	1.30-1.35	0.6-2.0	0.18-0.20	5.1-6.5	Moderate-----	0.43		
	44-60	22-28	1.35-1.40	0.6-2.0	0.18-0.20	5.6-7.3	Moderate-----	0.43		
133-------------- Colo	0-38	27-32	1.28-1.32	0.6-2.0	0.21-0.23	5.6-7.3	High---------	0.28	5	7
	38-60	28-35	1.35-1.45	0.6-2.0	0.18-0.20	6.1-7.3	High---------	0.28		
133+------------- Colo	0-18	20-26	1.25-1.30	0.6-2.0	0.22-0.24	6.6-7.3	Moderate-----	0.28	5	6
	18-38	32-36	1.25-1.35	0.6-2.0	0.18-0.20	6.1-7.3	High---------	0.28		
	38-60	28-35	1.35-1.45	0.6-2.0	0.18-0.20	6.1-7.3	High---------	0.28		
142, 142B-------- Chaseburg	0-60	12-16	1.35-1.55	0.6-2.0	0.22-0.24	6.1-7.3	Low----------	0.37	5	5
143-------------- Brady	0-12	2-15	1.25-1.41	2.0-6.0	0.12-0.15	5.6-7.3	Low----------	0.20	5	3
	12-25	5-22	1.35-1.45	2.0-6.0	0.12-0.17	5.1-6.5	Low----------	0.20		
	25-35	5-20	1.25-1.50	2.0-20	0.08-0.10	5.1-6.5	Low----------	0.20		
	35-60	0-10	1.25-1.50	>20	0.02-0.04	5.1-6.5	Low----------	0.10		
152-------------- Marshan	0-17	27-35	1.30-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Moderate-----	0.28	4	7
	17-38	18-30	1.45-1.55	0.6-2.0	0.15-0.19	5.6-7.3	Low----------	0.28		
	38-60	<5	1.55-1.65	6.0-20	0.02-0.05	6.1-7.3	Low----------	0.15		
159, 159C-------- Finchford	0-31	5-10	1.50-1.55	>6.0	0.10-0.12	5.6-7.3	Low----------	0.17	5	2
	31-60	2-8	1.50-1.60	>20	0.04-0.06	5.1-6.5	Low----------	0.17		
160-------------- Walford	0-9	20-26	1.30-1.35	0.6-2.0	0.21-0.23	5.6-7.3	Moderate-----	0.32	5	6
	9-19	16-22	1.35-1.40	0.6-2.0	0.20-0.22	5.6-7.3	Low----------	0.43		
	19-54	32-36	1.35-1.40	0.06-0.2	0.18-0.20	5.1-6.0	High---------	0.43		
	54-60	24-27	1.40-1.45	0.6-2.0	0.20-0.22	5.6-7.8	Moderate-----	0.43		
162B, 162C, 162C2, 162D, 162D2, 162E2---- Downs	0-12	18-24	1.25-1.30	0.6-2.0	0.21-0.23	5.1-7.3	Low----------	0.32	5	6
	12-43	26-34	1.30-1.35	0.6-2.0	0.18-0.20	4.5-6.0	Moderate-----	0.43		
	43-60	22-26	1.35-1.45	0.6-2.0	0.18-0.20	5.6-7.3	Moderate-----	0.43		
163B, 163C, 163C2, 163D2---- Fayette	0-8	15-25	1.30-1.35	0.6-2.0	0.20-0.22	5.1-7.3	Low----------	0.37	5	6
	8-56	30-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.0	Moderate-----	0.37		
	56-60	22-26	1.45-1.50	0.6-2.0	0.18-0.20	5.1-7.8	Moderate-----	0.37		
163D3------------ Fayette	0-6	28-32	1.35-1.45	0.6-2.0	0.18-0.20	5.1-7.3	Moderate-----	0.37	4	7
	6-56	30-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.0	Moderate-----	0.37		
	56-60	22-26	1.45-1.50	0.6-2.0	0.18-0.20	5.1-7.8	Moderate-----	0.37		
163E2------------ Fayette	0-8	15-25	1.30-1.35	0.6-2.0	0.20-0.22	5.1-7.3	Low----------	0.37	5	6
	8-56	30-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.0	Moderate-----	0.37		
	56-60	22-26	1.45-1.50	0.6-2.0	0.18-0.20	5.1-7.8	Moderate-----	0.37		
163E3------------ Fayette	0-6	28-32	1.35-1.45	0.6-2.0	0.18-0.20	5.1-7.3	Moderate-----	0.37	4	7
	6-56	30-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.0	Moderate-----	0.37		
	56-60	22-26	1.45-1.50	0.6-2.0	0.18-0.20	5.1-7.8	Moderate-----	0.37		
163F2------------ Fayette	0-8	15-25	1.30-1.35	0.6-2.0	0.20-0.22	5.1-7.3	Low----------	0.37	5	6
	8-56	30-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.0	Moderate-----	0.37		
	56-60	22-26	1.45-1.50	0.6-2.0	0.18-0.20	5.1-7.8	Moderate-----	0.37		

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group
	In	Pct	G/cm^3	In/hr	In/in	pH				
163F3	0-6	28-32	1.35-1.45	0.6-2.0	0.18-0.20	5.1-7.3	Moderate	0.37	4	7
Fayette	6-56	30-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.0	Moderate	0.37		
	56-60	22-26	1.45-1.50	0.6-2.0	0.18-0.20	5.1-7.8	Moderate	0.37		
163G	0-8	15-25	1.30-1.35	0.6-2.0	0.20-0.22	5.1-7.3	Low	0.37	5	6
Fayette	8-56	30-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.0	Moderate	0.37		
	56-60	22-26	1.45-1.50	0.6-2.0	0.18-0.20	5.1-7.8	Moderate	0.37		
163G3	0-6	28-32	1.35-1.45	0.6-2.0	0.18-0.20	5.1-7.3	Moderate	0.37	4	7
Fayette	6-56	30-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.0	Moderate	0.37		
	56-60	22-26	1.45-1.50	0.6-2.0	0.18-0.20	5.1-7.8	Moderate	0.37		
175, 175B, 175C, 175D	0-28	12-18	1.50-1.55	2.0-6.0	0.12-0.15	5.6-7.3	Low	0.20	4	3
Dickinson	28-35	5-10	1.55-1.65	6.0-20	0.08-0.10	5.1-6.5	Low	0.20		
	35-60	5-10	1.60-1.70	6.0-20	0.02-0.04	5.1-6.5	Low	0.15		
177, 177B, 177C	0-18	18-24	1.40-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Low	0.28	4	5
Saude	18-30	12-20	1.40-1.50	0.6-6.0	0.15-0.19	5.1-6.0	Low	0.28		
	30-60	2-8	1.50-1.75	>20	0.02-0.06	5.1-6.5	Very low	0.10		
178, 178B	0-19	18-24	1.40-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Low	0.24	4	6
Waukee	19-37	18-26	1.40-1.50	0.6-2.0	0.15-0.19	4.5-6.5	Low	0.32		
	37-60	2-8	1.50-1.75	>20	0.02-0.06	5.6-7.3	Low	0.10		
179D2	0-7	24-27	1.50-1.55	0.6-2.0	0.20-0.22	5.6-7.3	Moderate	0.28	5	6
Gara	7-44	30-38	1.55-1.75	0.2-0.6	0.16-0.18	4.5-7.3	Moderate	0.28		
	44-60	24-38	1.75-1.85	0.2-0.6	0.16-0.18	6.6-7.8	Moderate	0.37		
184	0-8	26-30	1.30-1.35	0.6-2.0	0.22-0.24	5.1-7.3	Moderate	0.32	5	6
Klinger	8-31	30-34	1.35-1.45	0.6-2.0	0.18-0.20	5.1-6.5	Moderate	0.43		
	31-60	22-28	1.65-1.80	0.6-2.0	0.17-0.19	5.6-7.8	Low	0.43		
213B	0-14	18-28	1.30-1.40	0.6-2.0	0.20-0.22	5.1-6.5	Low	0.28	4	6
Rockton	14-34	25-35	1.40-1.55	0.6-2.0	0.17-0.19	5.1-7.3	Moderate	0.28		
	34	---	---	---	---	---	-------------	----		
214B, 214C	0-14	18-28	1.30-1.40	0.6-2.0	0.20-0.22	5.1-6.5	Low	0.28	4	6
Rockton	14-25	25-35	1.40-1.55	0.6-2.0	0.17-0.19	5.1-7.3	Moderate	0.28		
	25	---	---	---	---	---	-------------	----		
216B, 216C	0-13	10-18	1.35-1.55	0.6-2.0	0.22-0.24	5.6-7.3	Low	0.32	4	5
Ripon	13-30	22-30	1.55-1.65	0.6-2.0	0.18-0.22	5.1-6.5	Moderate	0.32		
	30	---	---	---	---	---	-------------	----		
217B, 217C	1-18	10-18	1.35-1.55	0.6-2.0	0.22-0.24	5.6-7.3	Low	0.32	4	5
Ripon	18-34	22-30	1.55-1.65	0.6-2.0	0.18-0.22	5.1-6.5	Moderate	0.32		
	34	---	---	---	---	---	-------------	----		
221	0-39	---	0.25-0.45	2.0-6.0	0.35-0.45	5.1-7.8	-------------	----	---	3
Palms	39-60	7-35	1.40-1.95	0.6-2.0	0.14-0.22	6.1-8.4	Low	----		
226	0-17	18-24	1.40-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Low	0.28	4	6
Lawler	17-35	20-26	1.45-1.60	0.6-2.0	0.16-0.18	5.1-6.5	Low	0.28		
	35-60	2-12	1.60-1.75	>20	0.02-0.04	6.1-6.5	Low	0.10		
249, 249B	0-10	18-24	1.25-1.30	0.2-0.6	0.20-0.22	4.5-7.3	Low	0.43	3	6
Zwingle	10-60	38-60	1.30-1.45	<0.06	0.12-0.16	4.5-7.3	High	0.43		
284B, 284C	0-19	12-18	1.50-1.55	2.0-6.0	0.12-0.14	6.1-7.3	Low	0.20	4	3
Flagler	19-35	10-15	1.55-1.60	2.0-6.0	0.11-0.13	5.1-6.5	Low	0.20		
	35-60	2-8	1.60-1.75	>20	0.02-0.04	5.1-7.3	Low	0.20		

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group
	In	Pct	G/cm3	In/hr	In/in	pH				
285B, 285D, 285F2 Burkhardt	0-14	5-12	1.35-1.70	2.0-6.0	0.13-0.15	5.1-7.3	Low	0.20	3	3
	14-23	8-18	1.65-1.75	2.0-6.0	0.12-0.19	5.1-6.5	Low	0.20		
	23-60	1-6	1.50-1.60	6.0-20	0.02-0.04	5.6-6.5	Low	0.10		
291 Atterberry	0-17	20-26	1.20-1.35	0.6-2.0	0.22-0.24	5.1-7.3	Low	0.32	5	6
	17-44	25-35	1.30-1.50	0.6-2.0	0.18-0.20	5.1-6.0	Moderate	0.43		
	44-60	20-30	1.35-1.55	0.6-2.0	0.20-0.22	5.6-7.3	Low	0.43		
293E*: Chelsea	0-6	8-15	1.50-1.55	6.0-20	0.10-0.15	5.6-7.3	Low	0.17	5	2
	6-60	5-10	1.55-1.70	6.0-20	0.06-0.08	5.1-5.5	Low	0.17		
Lamont	0-9	10-15	1.50-1.55	2.0-6.0	0.16-0.18	5.1-7.3	Low	0.24	5	3
	9-30	10-22	1.45-1.65	2.0-6.0	0.14-0.16	5.1-6.0	Low	0.24		
	30-60	2-10	1.65-1.75	6.0-20	0.09-0.11	5.1-6.5	Low	0.17		
Fayette	0-8	15-25	1.30-1.35	0.6-2.0	0.20-0.22	5.1-7.3	Low	0.37	5	6
	8-56	30-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.0	Moderate	0.37		
	56-60	22-26	1.45-1.50	0.6-2.0	0.18-0.20	5.1-7.8	Moderate	0.37		
315*: Fluvents.										
Ambraw	0-22	21-33	1.50-1.70	0.6-2.0	0.17-0.23	6.1-7.3	Moderate	0.28	5	6
	22-47	24-35	1.45-1.65	0.2-2.0	0.15-0.19	5.6-7.8	Moderate	0.28		
	47-60	20-30	1.50-1.70	0.2-2.0	0.11-0.22	6.1-8.4	Low	0.28		
350, 350B, 350C Waukegan	0-15	18-30	1.35-1.55	0.6-2.0	0.22-0.24	5.6-7.3	Low	0.32	4	6
	15-35	18-30	1.35-1.55	0.6-2.0	0.20-0.22	5.1-7.3	Low	0.43		
	35-60	1-10	1.50-1.70	>20	0.02-0.04	5.6-7.8	Low	0.10		
351 Atterberry	0-16	20-26	1.30-1.35	0.6-2.0	0.22-0.24	5.1-7.3	Low	0.32	4	6
	16-46	28-34	1.35-1.45	0.6-2.0	0.18-0.20	5.1-6.0	Moderate	0.43		
	46-50	10-14	1.50-1.60	2.0-6.0	0.11-0.13	5.6-6.0	Low	0.24		
	50-60	2-8	1.60-1.70	6.0-20	0.05-0.10	5.6-7.3	Low	0.24		
352B Whittier	0-17	18-24	1.25-1.30	0.6-2.0	0.20-0.22	5.6-7.3	Low	0.32	4	6
	17-31	28-32	1.30-1.40	0.6-2.0	0.17-0.19	5.1-6.5	Moderate	0.43		
	31-60	2-10	1.60-1.70	6.0-20	0.04-0.07	5.1-6.5	Low	0.17		
353, 353B, 353C Tell	0-11	14-18	1.35-1.55	0.6-2.0	0.22-0.24	5.1-7.3	Low	0.37	4	5
	11-30	20-28	1.55-1.65	0.6-2.0	0.18-0.22	5.1-6.5	Moderate	0.37		
	30-39	10-25	1.55-1.65	0.6-2.0	0.12-0.19	5.1-6.5	Low	0.37		
	39-60	2-8	1.55-1.70	6.0-20	0.05-0.07	5.1-6.5	Low	0.15		
354*. Aquolls										
373E2 Timula	0-60	10-18	1.30-1.60	0.6-2.0	0.20-0.24	6.1-8.4	Low	0.37	5	5
377B, 377C Dinsdale	0-7	25-29	1.25-1.30	0.6-2.0	0.21-0.23	5.1-7.3	Moderate	0.32	5	7
	7-35	30-34	1.30-1.35	0.6-2.0	0.18-0.20	5.1-7.3	Moderate	0.43		
	35-60	20-28	1.65-1.80	0.6-2.0	0.17-0.19	5.6-8.4	Low	0.43		
382 Maxfield	0-19	30-35	1.35-1.40	0.6-2.0	0.21-0.23	6.6-7.3	High	0.24	5	6
	19-36	28-34	1.40-1.50	0.6-2.0	0.18-0.20	6.1-7.3	High	0.32		
	36-60	16-26	1.65-1.85	0.6-2.0	0.17-0.19	6.1-7.8	Low	0.32		

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group
	In	Pct	G/cm3	In/hr	In/in	pH				
399-------------- Readlyn	0-14	18-24	1.35-1.40	0.6-2.0	0.20-0.22	5.1-7.3	Low-----------	0.24	5	6
	14-47	22-28	1.45-1.70	0.6-2.0	0.17-0.19	5.1-7.3	Low-----------	0.32		
	47-60	18-28	1.70-1.80	0.6-2.0	0.17-0.19	6.6-7.8	Low-----------	0.32		
404-------------- Thorp	0-22	20-27	1.30-1.50	0.2-0.6	0.22-0.24	5.1-7.3	Low-----------	0.37	4	6
	22-41	27-35	1.35-1.55	0.06-0.2	0.18-0.20	5.6-6.5	Moderate------	0.37		
	41-46	20-30	1.40-1.60	0.06-0.2	0.15-0.22	5.6-7.3	Moderate------	0.37		
	46-60	5-20	1.50-1.70	2.0-6.0	0.05-0.13	5.6-7.3	Low-----------	0.37		
407B------------- Schley	0-14	18-22	1.40-1.45	0.6-2.0	0.19-0.21	4.5-6.5	Moderate------	0.32	5	6
	14-44	15-28	1.45-1.65	0.6-2.0	0.12-0.16	4.5-5.5	Low-----------	0.32		
	44-60	20-28	1.65-1.80	0.6-2.0	0.16-0.18	5.1-7.8	Low-----------	0.32		
408B------------- Olin	0-25	12-18	1.45-1.50	2.0-6.0	0.13-0.15	5.6-7.3	Low-----------	0.20	5	3
	25-34	20-28	1.50-1.70	0.6-2.0	0.17-0.19	5.6-6.0	Low-----------	0.32		
	34-60	20-28	1.70-1.80	0.6-2.0	0.17-0.19	6.1-7.8	Low-----------	0.32		
409B------------- Dickinson	0-19	12-18	1.50-1.55	2.0-6.0	0.12-0.15	5.6-7.3	Low-----------	0.20	4	3
	19-45	5-15	1.45-1.55	6.0-20	0.08-0.10	5.1-6.0	Low-----------	0.20		
	45-60	20-24	1.55-1.80	0.6-2.0	0.17-0.19	5.6-6.5	Low-----------	0.37		
412D------------- Sogn	0-13	18-25	1.15-1.20	0.6-2.0	0.17-0.22	6.1-8.4	Moderate------	0.32	1	4L
	13	---	---	---	---	---	-------------	----		
420, 420B-------- Tama	0-19	24-29	1.25-1.30	0.6-2.0	0.22-0.24	5.1-7.3	Moderate------	0.32	5	7
	19-44	28-34	1.30-1.35	0.6-2.0	0.18-0.20	5.1-6.0	Moderate------	0.43		
	44-60	22-28	1.35-1.40	0.6-2.0	0.18-0.20	5.6-7.3	Moderate------	0.43		
426B------------- Aredale	0-17	20-26	1.40-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Low-----------	0.28	5	6
	17-42	22-28	1.45-1.65	0.6-2.0	0.17-0.19	5.1-6.0	Low-----------	0.28		
	42-60	18-24	1.70-1.80	0.6-2.0	0.17-0.19	5.6-7.3	Low-----------	0.37		
428B------------- Ely	0-9	25-30	1.30-1.35	0.6-2.0	0.21-0.23	5.6-7.3	Moderate------	0.32	5	7
	9-60	28-32	1.30-1.40	0.6-2.0	0.18-0.20	5.6-7.3	Moderate------	0.43		
462, 462B, 462C-- Downs	0-12	18-24	1.25-1.30	0.6-2.0	0.21-0.23	5.1-7.3	Low-----------	0.32	5	6
	12-43	26-34	1.30-1.35	0.6-2.0	0.18-0.20	4.5-6.0	Moderate------	0.43		
	43-60	22-26	1.35-1.45	0.6-2.0	0.18-0.20	5.6-7.3	Moderate------	0.43		
463B------------- Fayette	0-8	15-25	1.30-1.35	0.6-2.0	0.20-0.22	5.1-7.3	Low-----------	0.37	5	6
	8-56	30-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.0	Moderate------	0.37		
	56-60	22-26	1.45-1.50	0.6-2.0	0.18-0.20	5.1-7.8	Moderate------	0.37		
478G*: Rock outcrop.										
Nordness---------	0-7	18-24	1.30-1.35	0.6-2.0	0.20-0.22	5.6-7.3	Low-----------	0.43	2	6
	7-15	27-35	1.35-1.60	0.06-0.2	0.12-0.15	5.6-7.3	High----------	0.43		
	15	---	---	---	---	---	-------------	----		
499D, 499F------- Nordness	0-7	18-24	1.30-1.35	0.6-2.0	0.20-0.22	5.6-7.3	Low-----------	0.43	2	6
	7-15	27-35	1.35-1.60	0.06-0.2	0.12-0.15	5.6-7.3	High----------	0.43		
	15	---	---	---	---	---	-------------	----		
591B*: Clyde-----------	0-18	28-32	1.40-1.45	0.6-2.0	0.21-0.23	6.6-7.3	Moderate------	0.28	5	7
	18-43	22-28	1.45-1.65	0.6-2.0	0.18-0.20	6.6-7.3	Moderate------	0.37		
	43-60	20-24	1.70-1.80	0.6-2.0	0.17-0.19	6.6-8.4	Moderate------	0.37		
Schley-----------	0-14	18-22	1.40-1.45	0.6-2.0	0.19-0.21	4.5-6.5	Moderate------	0.32	5	6
	14-44	15-28	1.45-1.65	0.6-2.0	0.12-0.16	4.5-5.5	Low-----------	0.32		
	44-60	20-28	1.65-1.80	0.6-2.0	0.16-0.18	5.1-7.8	Low-----------	0.32		
662C2, 662D2, 662E2----------- Mt. Carroll	0-8	15-22	1.25-1.45	0.6-2.0	0.22-0.24	5.6-7.3	Low-----------	0.32	5	6
	8-55	18-27	1.35-1.55	0.6-2.0	0.20-0.22	5.6-7.3	Low-----------	0.43		
	55-60	16-24	1.30-1.50	0.6-2.0	0.20-0.22	5.6-8.4	Low-----------	0.43		

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group
	In	Pct	G/cm3	In/hr	In/in	pH				
688	0-14	18-24	1.30-1.40	0.6-2.0	0.20-0.24	5.6-7.3	Moderate	0.32	5	7
Koszta	14-45	27-37	1.30-1.45	0.6-2.0	0.15-0.19	5.1-7.3	Moderate	0.43		
	45-60	18-24	1.65-1.75	0.6-2.0	0.5-0.19	5.6-6.5	Low	0.43		
727	0-15	18-27	1.30-1.50	0.6-2.0	0.20-0.24	5.6-7.3	Moderate	0.37	5	6
Udolpho	15-36	18-30	1.40-1.55	0.6-2.0	0.16-0.22	5.1-6.0	Moderate	0.37		
	36-60	<5	1.55-1.65	6.0-20	0.02-0.08	5.6-7.8	Low	0.15		
728	0-15	18-27	1.30-1.50	0.6-2.0	0.20-0.24	5.6-7.3	Moderate	0.37	5	6
Udolpho	15-30	18-30	1.40-1.55	0.6-2.0	0.16-0.22	5.1-6.0	Moderate	0.37		
	30-60	<5	1.55-1.65	6.0-20	0.02-0.08	5.6-7.8	Low	0.15		
733	0-19	28-33	1.25-1.30	0.6-2.0	0.21-0.23	7.4-8.4	High	0.28	5	7
Calco	19-52	22-32	1.30-1.45	0.6-2.0	0.18-0.20	7.4-8.4	Moderate	0.28		
	52-60	2-10	1.50-1.65	2.0-6.0	0.08-0.12	7.4-8.4	Low	0.28		
760	0-24	18-25	1.30-1.35	0.6-2.0	0.21-0.23	5.6-7.3	Moderate	0.32	5	6
Ansgar	24-39	30-35	1.35-1.40	0.6-2.0	0.18-0.20	5.6-6.0	High	0.43		
	39-60	20-28	1.65-1.80	0.6-2.0	0.17-0.19	5.6-6.5	Low	0.43		
777B, 777C	0-18	18-24	1.40-1.45	0.6-2.0	0.18-0.20	5.6-7.3	Low	0.28	4	6
Wapsie	18-29	18-25	1.45-1.50	0.6-2.0	0.15-0.17	5.6-6.0	Low	0.28		
	29-60	2-10	1.50-1.75	>20.0	0.02-0.06	5.1-7.3	Low	0.10		
809B	0-28	8-15	1.50-1.55	2.0-6.0	0.12-0.14	5.6-7.3	Low	0.20	4	3
Bertram	28-33	2-10	1.50-1.75	2.0-6.0	0.10-0.12	5.6-6.5	Low	0.20		
	33	---	---	---	---	---	------------	----		
918	0-15	30-35	1.30-1.35	0.6-2.0	0.21-0.23	5.6-7.3	High	0.28	5	7
Garwin	15-42	28-34	1.25-1.35	0.6-2.0	0.18-0.20	6.1-7.3	High	0.43		
	42-46	15-25	1.25-1.35	2.0-6.0	0.11-0.17	6.1-7.3	Low	0.24		
	46-60	3-10	1.30-1.55	6.0-20	0.05-0.10	6.6-7.3	Low	0.24		
919	0-21	24-27	1.25-1.35	0.6-2.0	0.22-0.24	5.1-7.3	Moderate	0.28	5	6
Muscatine	21-47	30-34	1.25-1.35	0.6-2.0	0.18-0.20	5.1-6.0	Moderate	0.43		
	47-55	15-20	1.25-1.35	2.0-6.0	0.11-0.17	5.1-7.3	Low	0.24		
	55-60	3-10	1.30-1.35	6.0-20	0.05-0.10	6.1-7.3	Low	0.24		
920, 920B	0-22	24-28	1.25-1.30	0.6-2.0	0.22-0.24	5.1-7.3	Moderate	0.32	5	7
Tama	22-41	28-34	1.30-1.35	0.6-2.0	0.19-0.22	5.1-6.0	Moderate	0.43		
	41-45	15-20	1.30-1.35	2.0-6.0	0.11-0.17	5.1-6.5	Low	0.24		
	45-60	3-10	1.30-1.35	6.0-20	0.05-0.10	5.1-7.3	Low	0.24		
923	0-21	8-18	1.55-1.70	2.0-6.0	0.10-0.18	5.6-7.3	Low	0.20	5	3
Coyne	21-32	18-24	1.40-1.60	2.0-6.0	0.15-0.19	5.6-7.3	Low	0.20		
	32-55	18-35	1.35-1.55	0.6-2.0	0.15-0.20	5.6-7.3	Moderate	0.43		
	55-60	2-10	1.70-1.90	6.0-20	0.02-0.04	5.6-8.4	Low	0.10		
933	0-37	27-35	1.20-1.40	0.6-2.0	0.21-0.23	6.1-7.8	Moderate	0.28	5	7
Sawmill	37-60	20-26	1.30-1.40	0.6-2.0	0.20-0.22	6.1-7.8	Moderate	0.28		
949	0-7	38-50	1.25-1.30	0.2-0.6	0.14-0.16	5.1-7.3	High	0.32	3	6
Zwingle Variant	7-60	50-80	1.30-1.40	<0.06	0.12-0.14	4.0-5.5	Very high	0.28		
951F	0-8	15-27	1.35-1.60	0.6-2.0	0.22-0.24	5.1-6.5	Low	0.37	3	5
Medary	8-15	25-40	1.55-1.65	0.2-0.6	0.18-0.22	4.5-6.0	Moderate	0.37		
	15-60	35-60	1.55-1.70	0.06-0.2	0.11-0.20	4.5-7.8	High	0.37		
953	0-9	40-55	1.25-1.30	0.06-0.2	0.12-0.16	6.1-7.3	High	0.28	3	6
Darwin Variant	9-20	42-60	1.30-1.35	<0.06	0.11-0.14	6.1-7.3	High	0.28		
	20	---	---	---	---	---	------------	----		
960	0-13	20-30	1.45-1.55	0.6-2.0	0.20-0.22	5.1-7.3	Moderate	0.24	5	6
Shaffton	13-36	18-26	1.55-1.65	0.6-2.0	0.17-0.19	4.5-6.0	Moderate	0.32		
	36-39	8-16	1.65-1.70	6.0-20	0.05-0.08	4.5-6.0	Low	0.17		
	39-45	28-32	1.45-1.50	0.6-2.0	0.17-0.19	5.1-6.5	Moderate	0.43		
	45-60	2-6	1.65-1.75	>20	0.03-0.05	6.1-7.3	Very low	0.15		

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group
	In	Pct	G/cm3	In/hr	In/in	pH				
961-------------- Ambraw	0-8	21-33	1.50-1.70	0.6-2.0	0.17-0.23	6.1-7.3	Moderate-----	0.28	5	6
	8-47	18-26	1.45-1.65	0.2-2.0	0.15-0.19	5.6-7.8	Moderate-----	0.28		
	47-60	5-10	1.50-1.70	0.2-2.0	0.11-0.22	5.6-8.4	Low----------	0.28		
962-------------- Elvira	0-15	28-34	1.25-1.35	0.6-2.0	0.20-0.22	5.6-7.3	High---------	0.28	5	7
	15-48	28-35	1.35-1.45	0.6-2.0	0.17-0.19	5.6-7.3	High---------	0.43		
	48-60	8-26	1.45-1.50	6.0-20	0.06-0.13	6.1-7.3	Low----------	0.20		
963-------------- Elvers	0-35	7-14	1.35-1.55	0.6-2.0	0.20-0.22	6.1-7.3	Low----------	0.28	5	5
	35-55	---	---	0.6-6.0	0.35-0.45	6.1-6.5	-------------	----		
	55-60	2-20	1.55-1.70	0.6-2.0	0.05-0.22	6.1-7.3	Low----------	0.28		
976-------------- Raddle	0-19	18-24	1.30-1.55	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.32	5-4	6
	19-60	18-24	1.30-1.50	0.6-2.0	0.20-0.22	5.6-7.3	Low----------	0.43		
1118------------- Garwin	0-18	30-35	1.30-1.35	0.6-2.0	0.21-0.23	5.6-7.3	High---------	0.28	5	7
	18-50	28-34	1.28-1.35	0.6-2.0	0.18-0.20	6.1-7.3	High---------	0.28		
	50-60	20-26	1.35-1.45	0.6-2.0	0.20-0.22	6.6-7.8	Moderate-----	0.28		
1119------------- Muscatine	0-19	24-27	1.28-1.32	0.6-2.0	0.22-0.24	5.1-7.3	Moderate-----	0.28	5	6
	19-54	30-34	1.28-1.35	0.6-2.0	0.18-0.20	5.1-7.3	Moderate-----	0.43		
	54-60	22-26	1.35-1.40	0.6-2.0	0.18-0.20	6.6-7.8	Moderate-----	0.43		
1142------------- Chaseburg	0-60	12-16	1.35-1.55	0.6-2.0	0.22-0.24	6.1-7.3	Low----------	0.37	5	5
1160------------- Walford	0-9	20-26	1.30-1.35	0.6-2.0	0.21-0.23	5.6-7.3	Moderate-----	0.32	5	6
	9-19	16-22	1.35-1.40	0.6-2.0	0.20-0.22	5.6-7.3	Low----------	0.43		
	19-54	32-36	1.35-1.40	0.06-0.2	0.18-0.20	5.1-6.0	High---------	0.43		
	54-60	24-27	1.40-1.45	0.6-2.0	0.20-0.22	5.6-7.8	Moderate-----	0.43		
1291------------- Atterberry	0-17	20-26	1.20-1.35	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.32	5	6
	17-44	25-35	1.30-1.50	0.6-2.0	0.18-0.20	5.1-6.0	Moderate-----	0.43		
	44-60	20-30	1.35-1.55	0.6-2.0	0.20-0.22	5.6-7.3	Low----------	0.43		
1777------------- Wapsie Variant	0-9	18-24	1.40-1.45	0.6-2.0	0.18-0.20	5.6-7.3	Low----------	0.28	4	6
	9-21	18-25	1.45-1.50	0.6-2.0	0.15-0.17	5.1-6.0	Low----------	0.28		
	21-60	2-10	1.50-1.75	6.0-20	0.05-0.07	6.1-7.3	Low----------	0.15		
1954------------- Darwin	0-12	35-45	1.20-1.40	<0.06	0.11-0.14	6.1-7.0	High---------	0.28	3	4
	12-48	42-55	1.30-1.50	<0.06	0.11-0.14	6.1-7.8	High---------	0.28		
	48	---	---	---	---	---	-------------	----		
5010*, 5030*. Pits										
5040*. Orthents										

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--SOIL AND WATER FEATURES

[The definitions of "flooding" and "water table" in the text explain terms such as "rare," "brief," "apparent," and "perched." The symbol > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hard-ness	Uncoated steel	Concrete
					Ft			In			
11B*:											
Colo--------------	B/D	Frequent----	Very brief	Feb-Nov	1.0-3.0	Apparent	Nov-Jul	>60	---	High-----	Moderate.
Ely---------------	B	None---------	---	---	2.0-4.0	Apparent	Nov-Jul	>60	---	High-----	Moderate.
41B, 41C, 41E----- Sparta	A	None---------	---	---	>6.0	---	---	>60	---	Low------	Moderate.
42---------------- Granby	A/D	Frequent----	Brief-----	Mar-Apr	0-1.0	Apparent	Nov-Jun	>60	---	High-----	Low.
51---------------- Vesser	C	Occasional	Brief-----	Feb-Nov	1.0-3.0	Apparent	Nov-Jul	>60	---	High-----	Moderate.
54---------------- Zook	C/D	Occasional	Brief to long.	Feb-Nov	1.0-3.0	Apparent	Nov-May	>60	---	High-----	Moderate.
63C, 63E, 63G----- Chelsea	A	None---------	---	---	>6.0	---	---	>60	---	Low------	Low.
65E2, 65E3, 65F2, 65F3, 65G, 65G3-- Lindley	C	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
83B, 83C, 83C2---- Kenyon	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
84---------------- Clyde	B/D	Frequent----	Very brief	Feb-Nov	1.0-2.5	Apparent	Nov-Jul	>60	---	High-----	Low.
88---------------- Nevin	B	Rare---------	---	---	2.0-4.0	Apparent	Nov-Jul	>60	---	High-----	Low.
110C-------------- Lamont	B	None---------	---	---	>6.0	---	---	>60	---	Low------	Moderate.
118--------------- Garwin	B/D	None---------	---	---	1.0-2.0	Apparent	Nov-Jul	>60	---	High-----	Moderate.
119--------------- Muscatine	B	None---------	---	---	2.0-4.0	Apparent	Nov-Jul	>60	---	High-----	Moderate.
120, 120B, 120C, 120C2, 120D, 120D2----------- Tama	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
133--------------- Colo	B/D	Occasional	Very brief to long.	Feb-Nov	1.0-3.0	Apparent	Nov-Jul	>60	---	High-----	Moderate.
133+-------------- Colo	B/D	Frequent----	Very brief to long.	Feb-Nov	1.0-3.0	Apparent	Nov-Jul	>60	---	High-----	Moderate.
142, 142B--------- Chaseburg	B	Frequent----	Very brief	Nov-Jun	3.0-6.0	Apparent	Nov-Apr	>60	---	Moderate	Moderate.
143--------------- Brady	B	None---------	---	---	1.0-3.0	Apparent	Nov-May	>60	---	Low------	Moderate.
152--------------- Marshan	B/D	Occasional	Brief-----	Mar-Nov	1.0-2.0	Apparent	Jan-Dec	>60	---	High-----	Moderate.
159--------------- Finchford	A	Rare---------	---	---	>6.0	---	---	>60	---	Low------	Low.

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Bedrock: Depth	Bedrock: Hard-ness	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft			In			
159C-------------- Finchford	A	None--------	---	---	>6.0	---	---	>60	---	Low------	Low.
160--------------- Walford	B/D	None--------	---	---	0-2.0	Apparent	Nov-Jul	>60	---	High-----	Moderate.
162B, 162C, 162C2, 162D, 162D2, 162E2----------- Downs	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
163B, 163C, 163C2, 163D2, 163D3, 163E2, 163E3, 163F2, 163F3, 163G, 163G3------ Fayette	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
175, 175B, 175C, 175D------------ Dickinson	B	None--------	---	---	>6.0	---	---	>60	---	Low------	Moderate.
177, 177B, 177C--- Saude	B	None--------	---	---	>6.0	---	---	>60	---	Low------	Moderate.
178, 178B--------- Waukee	B	None--------	---	---	>6.0	---	---	>60	---	Low------	Moderate.
179D2------------- Gara	C	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
184--------------- Klinger	B	None--------	---	---	2.0-4.0	Apparent	Nov-Jul	>60	---	High-----	Moderate.
213B, 214B, 214C-- Rockton	B	None--------	---	---	>6.0	---	---	20-40	Soft	Low------	Low.
216B, 216C, 217B, 217C------------ Ripon	B	None--------	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate.
221**------------- Palms	A/D	Frequent----	Long------	Nov-May	+.5-1.0	Apparent	Nov-May	>60	---	High-----	Moderate.
226--------------- Lawler	B	None--------	---	---	2.0-4.0	Apparent	Nov-May	>60	---	High-----	Moderate.
249, 249B--------- Zwingle	D	None--------	---	---	1.0-2.0	Perched	Nov-Jul	>60	---	High-----	Moderate.
284B, 284C-------- Flagler	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low.
285B, 285D, 285F2- Burkhardt	B	None--------	---	---	>6.0	---	---	>60	---	Low------	High.
291--------------- Atterberry	B	None--------	---	---	1.0-3.0	Apparent	Mar-Jun	>60	---	High-----	Moderate.
293E*:											
Chelsea-----------	A	None--------	---	---	>6.0	---	---	>60	---	Low------	Low.
Lamont------------	B	None--------	---	---	>6.0	---	---	>60	---	Low------	Moderate.
Fayette-----------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
315*: Fluvents.											
Ambraw------------	B/D	Frequent----	Brief-----	Mar-Jun	0-2.0	Apparent	Mar-Jun	>60	---	High-----	Moderate.

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hard-ness	Uncoated steel	Concrete
					Ft			In			
350, 350B, 350C--- Waukegan	B	None--------	---	---	>6.0	---	---	>60	---	Low-------	Moderate.
351--------------- Atterberry	B	None--------	---	---	2.0-4.0	Apparent	Nov-Jul	>60	---	High------	Moderate.
352B------------- Whittier	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
353, 353B, 353C--- Tell	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
354*. Aquolls											
373E2------------ Timula	B	None--------	---	---	>6.0	---	---	>60	---	Low-------	Low.
377B, 377C-------- Dinsdale	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
382--------------- Maxfield	B/D	None--------	---	---	1.0-2.0	Apparent	Nov-Jul	>60	---	High------	Moderate.
399--------------- Readlyn	B	None--------	---	---	2.0-4.0	Apparent	Nov-Jul	>60	---	High------	Moderate.
404--------------- Thorp	C/D	Occasional	Brief-----	Mar-Jun	0-2.0	Apparent	Feb-Jun	>60	---	High------	Moderate.
407B------------- Schley	B	None--------	---	---	2.0-4.0	Apparent	Nov-Jul	>60	---	High------	High.
408B------------- Olin	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
409B------------- Dickinson	A	None--------	---	---	>6.0	---	---	>60	---	Low-------	Moderate.
412D------------- Sogn	D	None--------	---	---	>6.0	---	---	4-20	Hard	Low-------	Low.
420, 420B--------- Tama	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
426B------------- Aredale	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
428B------------- Ely	B	None--------	---	---	2.0-4.0	Apparent	Nov-Jul	>60	---	High------	Moderate.
462, 462B, 462C--- Downs	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
463B------------- Fayette	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
478G*: Rock outcrop.											
Nordness----------	B	None--------	---	---	>6.0	---	---	8-20	Hard	Low-------	Low.
499D, 499F-------- Nordness	B	None--------	---	---	>6.0	---	---	8-20	Hard	Low-------	Low.
591B*: Clyde------------	B/D	Frequent----	Very brief	Feb-Nov	1.0-2.5	Apparent	Nov-Jul	>60	---	High------	Low.
Schley-----------	B	None--------	---	---	2.0-4.0	Apparent	Nov-Jul	>60	---	High------	High.

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hard-ness	Uncoated steel	Concrete
					Ft			In			
662C2, 662D2, 662E2: Mt. Carroll	B	None	---	---	>6.0	---	---	>60	---	Low	Moderate.
688: Koszta	B	Rare	---	---	2.0-3.0	Apparent	Nov-Jul	>60	---	Moderate	Moderate.
727, 728: Udolpho	B/D	None	---	---	1.0-3.0	Apparent	Oct-Jun	>60	---	Moderate	Moderate.
733: Calco	B/D	Occasional	Brief	Feb-Nov	1.0-3.0	Apparent	Nov-Jul	>60	---	High	Low.
760: Ansgar	B/D	None	---	---	1.0-2.0	Apparent	Nov-Jul	>60	---	High	Moderate.
777B, 777C: Wapsie	B	None	---	---	>6.0	---	---	>60	---	Low	High.
809B: Bertram	B	None	---	---	>6.0	---	---	20-40	Hard	Low	Moderate.
918: Garwin	B/D	None	---	---	1.0-3.0	Apparent	Nov-Jul	>60	---	High	Moderate.
919: Muscatine	B	None	---	---	2.0-5.0	Apparent	Nov-Jul	>60	---	High	Moderate.
920, 920B: Tama	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
923: Coyne	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
933: Sawmill	B/D	Frequent	Brief	Mar-Jun	0-2.0	Apparent	Mar-Jun	>60	---	High	Low.
949: Zwingle Variant	D	None	---	---	+.5-1.0	Perched	Nov-Jul	>60	---	High	High.
951F: Medary	C	None	---	---	>6.0	---	---	>60	---	High	High.
953: Darwin Variant	D	Rare	---	---	0-2.0	Apparent	Nov-Jul	20-40	Hard	High	Low.
960: Shaffton	B	Frequent	Brief	Feb-Nov	3.0-5.0	Apparent	Nov-Jul	>60	---	High	High.
961: Ambraw	B/D	Frequent	Brief	Mar-Jun	0-2.0	Apparent	Mar-Jun	>60	---	High	Moderate.
962: Elvira	B/D	Frequent	Brief	Feb-Nov	1.0-3.0	Apparent	Nov-Jul	>60	---	High	Moderate.
963: Elvers	B/D	Frequent	Long	Nov-May	0-1.0	Apparent	Nov-May	>60	---	High	Moderate.
976: Raddle	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
1118: Garwin	B/D	None	---	---	1.0-2.0	Apparent	Nov-Jul	>60	---	High	Moderate.
1119: Muscatine	B	None	---	---	2.0-4.0	Apparent	Nov-Jul	>60	---	High	Moderate.
1142: Chaseburg	B	Frequent	Very brief	Nov-Jun	3.0-6.0	Apparent	Nov-Apr	>60	---	Moderate	Moderate.

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hard-ness	Uncoated steel	Concrete
					Ft			In			
1160 Walford	B/D	None	---	---	0-2.0	Apparent	Nov-Jul	>60	---	High	Moderate.
1291 Atterberry	B	None	---	---	1.0-3.0	Apparent	Mar-Jun	>60	---	High	Moderate.
1777 Wapsie Variant	B	Frequent	Brief	Feb-Nov	>6.0	---	---	>60	---	Low	High.
1954 Darwin	D	Frequent	Long	Jan-Jun	0-2.0	Apparent	Jan-Jun	40-60	Hard	High	Low.
5010*, 5030*. Pits											
5040*. Orthents											

* See description of the map unit for composition and behavior characteristics of the map unit.
** A plus sign under "Depth to high water table" indicates that the water table is above the surface of the soil

TABLE 18.--CLASSIFICATION OF THE SOILS

[An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series]

Soil name	Family or higher taxonomic class
Ambraw	Fine-loamy, mixed, mesic Fluvaquentic Haplaquolls
Ansgar	Fine-silty, mixed, mesic Mollic Ochraqualfs
Aquolls	Loamy, mixed, mesic Haplaquolls
Aredale	Fine-loamy, mixed, mesic Typic Hapludolls
Atterberry	Fine-silty, mixed, mesic Udollic Ochraqualfs
Bertram	Coarse-loamy, mixed, mesic Typic Hapludolls
*Brady	Coarse-loamy, mixed, mesic Aquollic Hapludalfs
Burkhardt	Sandy, mixed, mesic Typic Hapludolls
*Calco	Fine-silty, mixed (calcareous), mesic Cumulic Haplaquolls
Chaseburg	Coarse-silty, mixed, nonacid, mesic Typic Udifluvents
Chelsea	Mixed, mesic Alfic Udipsamments
Clyde	Fine-loamy, mixed, mesic Typic Haplaquolls
Colo	Fine-silty, mixed, mesic Cumulic Haplaquolls
*Coyne	Coarse-loamy, mixed, mesic Typic Argiudolls
Darwin	Fine, montmorillonitic, mesic Vertic Haplaquolls
Darwin Variant	Fine, montmorillonitic, mesic. Typic Haplaquolls
Dickinson	Coarse-loamy, mixed, mesic Typic Hapludolls
Dinsdale	Fine-silty, mixed, mesic Typic Argiudolls
Downs	Fine-silty, mixed, mesic Mollic Hapludalfs
Elvers	Coarse-silty, mixed, nonacid, mesic Thapto-Histic Fluvaquents
Elvira	Fine-silty, mixed, mesic Typic Haplaquolls
Ely	Fine-silty, mixed, mesic Cumulic Hapludolls
Fayette	Fine-silty, mixed, mesic Typic Hapludalfs
Finchford	Sandy, mixed, mesic Entic Hapludolls
Flagler	Coarse-loamy, mixed, mesic Typic Hapludolls
Fluvents	Loamy and sandy, mixed, nonacid, mesic Udifluvents
Gara	Fine-loamy, mixed, mesic Mollic Hapludalfs
Garwin	Fine-silty, mixed, mesic Typic Haplaquolls
Granby	Sandy, mixed, mesic Typic Haplaquolls
Kenyon	Fine-loamy, mixed, mesic Typic Hapludolls
Klinger	Fine-silty, mixed, mesic Aquic Hapludolls
*Koszta	Fine-silty, mixed, mesic Udollic Ochraqualfs
Lamont	Coarse-loamy, mixed, mesic Typic Hapludalfs
Lawler	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Aquic Hapludolls
Lindley	Fine-loamy, mixed, mesic Typic Hapludalfs
Marshan	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Typic Haplaquolls
Maxfield	Fine-silty, mixed, mesic Typic Haplaquolls
*Medary	Fine, mixed, mesic Typic Hapludalfs
Mt. Carroll	Fine-silty, mixed, mesic Mollic Hapludalfs
Muscatine	Fine-silty, mixed, mesic Aquic Hapludolls
*Nevin	Fine-silty, mixed, mesic Aquic Argiudolls
Nordness	Loamy, mixed, mesic Lithic Hapludalfs
Olin	Coarse-loamy, mixed, mesic Typic Hapludolls
Orthents	Loamy, mixed, nonacid, mesic Udorthents
Palms	Loamy, mixed, euic, mesic Terric Medisaprists
Raddle	Fine-silty, mixed, mesic Typic Hapludolls
Readlyn	Fine-loamy, mixed, mesic Aquic Hapludolls
*Ripon	Fine-silty, mixed, mesic Typic Argiudolls
Rockton	Fine-loamy, mixed, mesic Typic Argiudolls
Saude	Coarse-loamy over sandy or sandy-skeletal, mixed, mesic Typic Hapludolls
Sawmill	Fine-silty, mixed, mesic Cumulic Haplaquolls
*Schley	Fine-loamy, mixed, mesic Udollic Ochraqualfs
Shaffton	Fine-loamy, mixed, mesic Fluvaquentic Hapludolls
*Sogn	Loamy, mixed, mesic Lithic Haplustolls
Sparta	Sandy, mixed, mesic Entic Hapludolls
Tama	Fine-silty, mixed, mesic Typic Argiudolls
Tell	Fine-silty over sandy or sandy-skeletal, mixed, mesic Typic Hapludalfs
Thorp	Fine-silty, mixed, mesic Argiaquic Argialbolls
Timula	Coarse-silty, mixed, mesic Typic Eutrochrepts
Udolpho	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Mollic Ochraqualfs
Vesser	Fine-silty, mixed, mesic Argiaquic Argialbolls
Walford	Fine-silty, mixed, mesic Mollic Ochraqualfs
Wapsie	Coarse-loamy over sandy or sandy-skeletal, mixed, mesic Mollic Hapludalfs
Wapsie Variant	Coarse-loamy, mixed, mesic Dystric Eutrochrepts
Waukee	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Typic Hapludolls
Waukegan	Fine-silty over sandy or sandy-skeletal, mixed, mesic Typic Hapludolls
Whittier	Fine-silty over sandy or sandy-skeletal, mixed, mesic Mollic Hapludalfs
Zook	Fine, montmorillonitic, mesic Cumulic Haplaquolls
Zwingle	Fine, montmorillonitic, mesic Typic Albaqualfs
Zwingle Variant	Very-fine, montmorillonitic, mesic. Vertic Ochraqualfs

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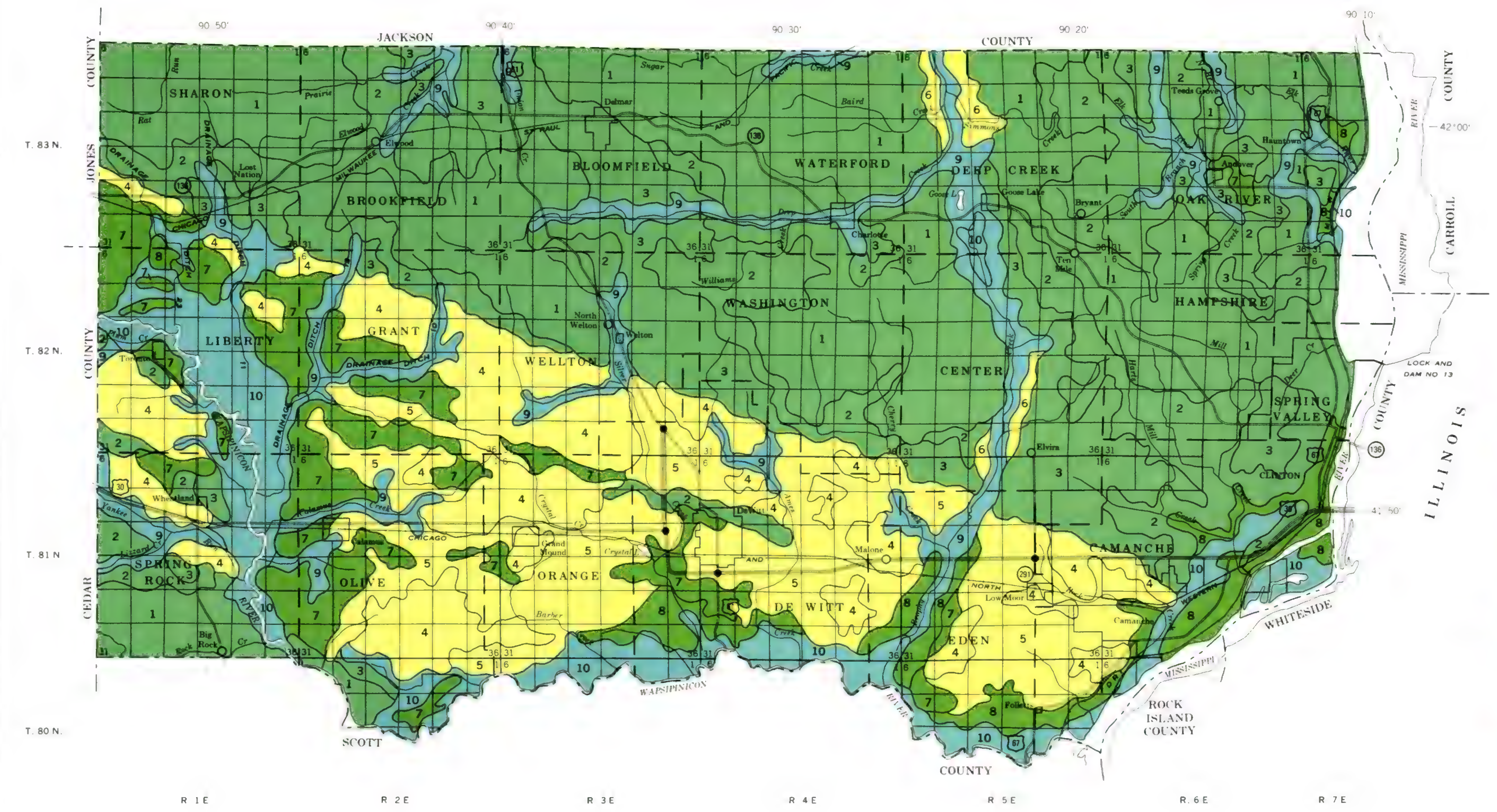
NRCS Accessibility Statement

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
IOWA AGRICULTURE AND HOME ECONOMICS EXPERIMENT STATION
COOPERATIVE EXTENSION SERVICE, IOWA STATE UNIVERSITY
DEPARTMENT OF SOIL CONSERVATION, STATE OF IOWA

GENERAL SOIL MAP

CLINTON COUNTY, IOWA

Scale 1:190,080



SOIL LEGEND

AREAS DOMINATED BY NEARLY LEVEL TO VERY STEEP, WELL DRAINED SOILS

1 Fayette association: Gently sloping to very steep, well drained soils that formed in loess; on uplands

2 Downs-Fayette association: Gently sloping to moderately steep, well drained soils that formed in loess; on uplands

3 Tama association: Nearly level to strongly sloping, well drained soils that formed in loess; on uplands

AREAS DOMINATED BY NEARLY LEVEL TO MODERATELY SLOPING, WELL DRAINED, SOMEWHAT POORLY DRAINED, AND POORLY DRAINED SOILS

4 Dinsdale-Klinger-Maxfield association: Nearly level to moderately sloping, well drained, somewhat poorly drained, and poorly drained soils that formed in loess and glacial till; on uplands

5 Atterberry-Tama association: Nearly level to gently sloping, somewhat poorly drained and well drained soils that formed in loess and underlying sandy material; on uplands and stream terraces

6 Walford-Atterberry association: Nearly level and very gently sloping, poorly drained and somewhat poorly drained soils that formed in loess; on stream terraces and uplands

AREAS DOMINATED BY NEARLY LEVEL TO MODERATELY STEEP, EXCESSIVELY DRAINED, SOMEWHAT EXCESSIVELY DRAINED, AND POORLY DRAINED SOILS

7 Sparta-Dickinson association: Nearly level to moderately steep, excessively drained and somewhat excessively drained soils that formed in eolian sands; on uplands and stream terraces

8 Finchford-Zwingle association: Nearly level to moderately sloping, excessively drained and poorly drained soils that formed in sandy alluvium and lacustrine clays; on stream terraces

AREAS DOMINATED BY NEARLY LEVEL, MODERATELY WELL DRAINED AND POORLY DRAINED SOILS THAT ARE SUBJECT TO FLOODING

9 Colo-Chaseburg-Sawmill association: Nearly level and gently sloping, poorly drained and moderately well drained soils that formed in silty alluvium; on flood plains

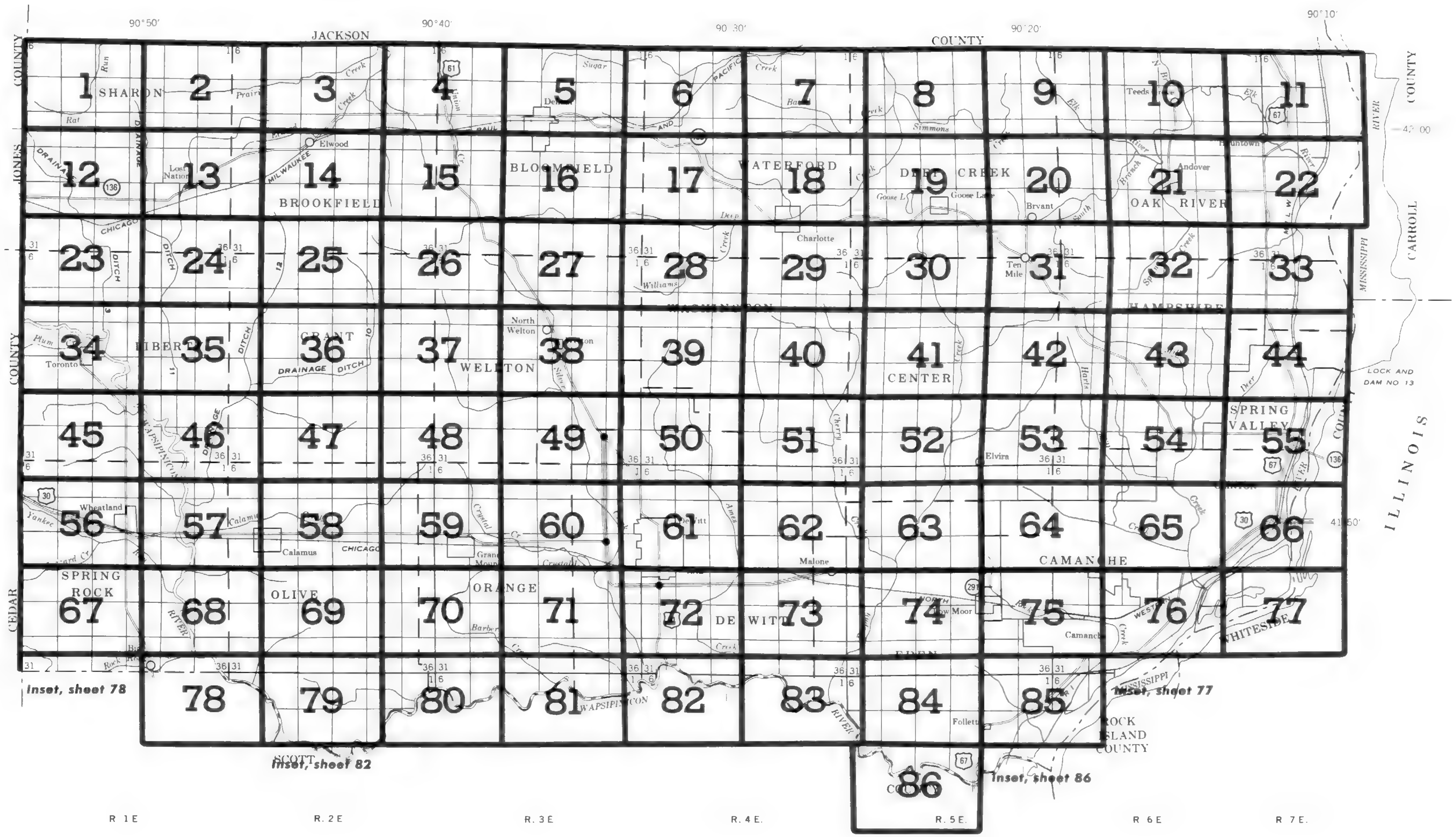
10 Ambraw association: Nearly level, poorly drained soils that formed in loamy alluvium; on flood plains

Compiled 1980

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.



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INDEX TO MAP SHEETS

CLINTON COUNTY, IOWA

Scale 1:190,080

1 0 1 2 3 4 Miles

1 0 1 2 3 4 5 6 Kilometers

Original text from each individual map sheet read:

This map is compiled on 1970 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

CLINTON COUNTY, IOWA

IOWA AGRICULTURE AND HOME ECONOMICS EXPERIMENT STATION
COOPERATIVE EXTENSION SERVICE, IOWA STATE UNIVERSITY
DEPARTMENT OF SOIL CONSERVATION, STATE OF IOWA

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National, state or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Limit of soil survey (label)
- Field sheet matchline & neatline

AD HOC BOUNDARY (label)

- Small airport, airfield, park, oilfield, cemetery, or flood pool (Davis Airstrip; FLOOD POOL LINE)

STATE COORDINATE TICK

LAND DIVISION CORNERS (sections and land grants)

ROADS

- Divided (median shown if scale permits)
- Other roads
- Trail

ROAD EMBLEMS & DESIGNATIONS

- Interstate (79)
- Federal (410)
- State (52)
- County, farm or ranch (378)

RAILROAD

POWER TRANSMISSION LINE (normally not shown)

PIPE LINE (normally not shown)

FENCE (normally not shown)

LEVEES

- Without road
- With road
- With railroad

DAMS

- Large (to scale)
- Medium or small (water)

PITS

- Gravel pit
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban areas)
- Church
- School
- Indian mound (label) (Indian Mound)
- Located object (label) (Tower)
- Tank (label) (GAS)
- Wells, oil or gas
- Windmill
- Kitchen midden

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
  - Crossable with tillage implements
  - Not crossable with tillage implements
- Drainage end
- Canals or ditches
  - Double-line (label) (CANAL)
  - Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial (water)
- Intermittent (int)

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Spring
- Well, artesian
- Well, irrigation
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS (163C2, 418)

ESCARPMENTS

- Bedrock (points down slope)
- Other than bedrock (points down slope)

SHORT STEEP SLOPE

GULLY

DEPRESSION OR SINK

SOIL SAMPLE SITE (normally not shown) (S)

MISCELLANEOUS

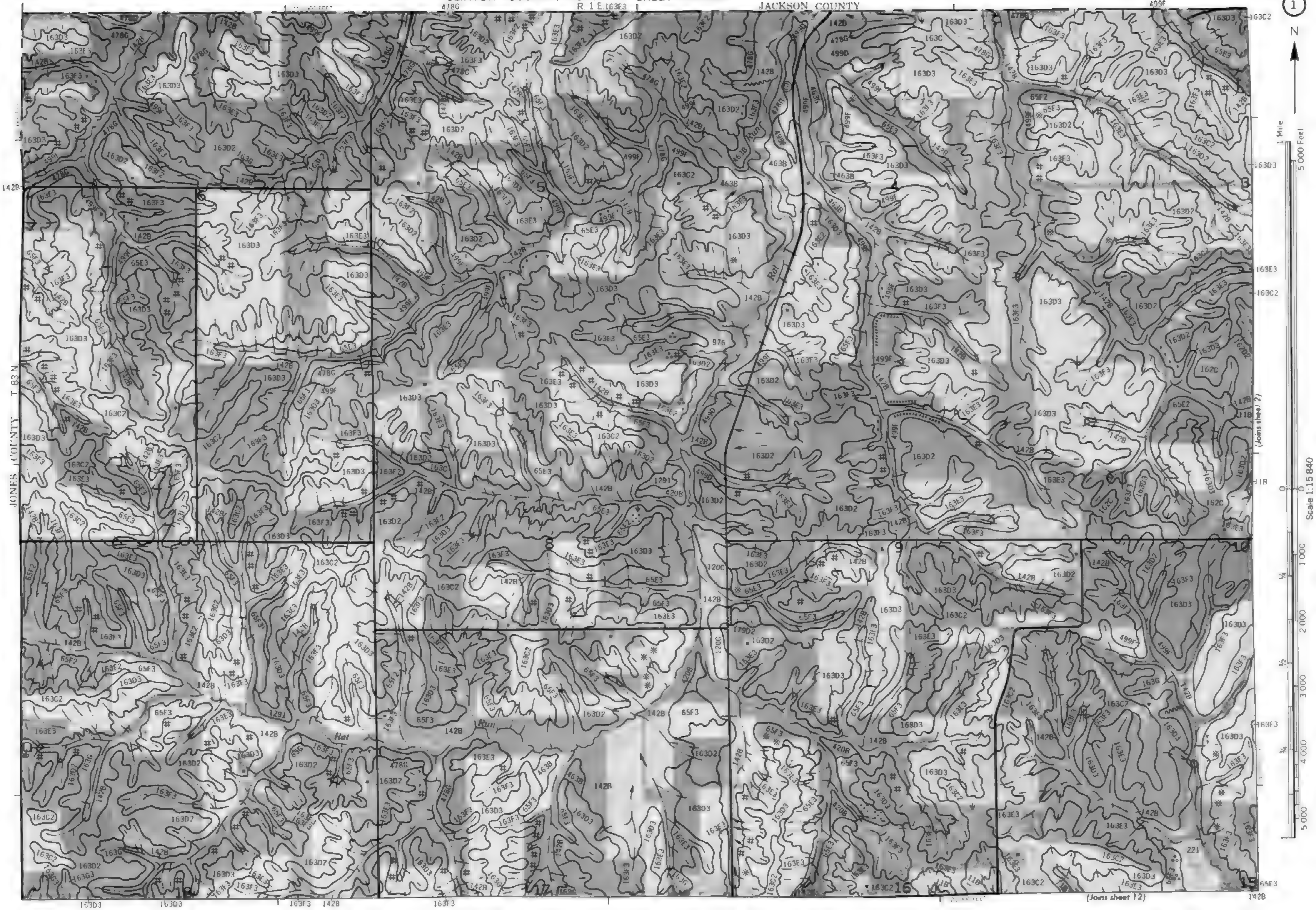
- Blowout
- Clay spot
- Gravelly spot
- Gumbo, slick or scabby spot (sodic)
- Dumps and other similar non soil areas
- Prominent hill or peak
- Rock outcrop (includes sandstone and shale)
- Saline spot
- Sandy spot
- Severely eroded spot
- Slide or slip (tips point upslope)
- Stony spot, very stony spot
- Calcareous spot
- Muck spot
- Cut and fill land spot
- Glacial till spot
- Sewage lagoon

SOIL LEGEND

Map symbols consist of numbers or a combination of numbers and letters. The initial numbers represent the kind of soil. A capital letter following these numbers indicates the class of slope. Symbols without a slope letter are for nearly level soils or miscellaneous areas. A final number of 2 following the slope letter indicates that the soil is moderately eroded and 3 that it is severely eroded.

SYMBOL	NAME	SYMBOL	NAME	SYMBOL	NAME
11B	Colo–Ely complex, 2 to 5 percent slopes	163E3	Fayette silty clay loam, 14 to 18 percent slopes, severely eroded	408B	Olin fine sandy loam, 2 to 5 percent slopes
41B	Sparta loamy fine sand, 2 to 5 percent slopes	163F2	Fayette silt loam, 18 to 25 percent slopes, moderately eroded	409B	Dickinson fine sandy loam, loam substratum, 2 to 5 percent slopes
41C	Sparta loamy fine sand, 5 to 9 percent slopes	163F3	Fayette silty clay loam, 18 to 25 percent slopes, severely eroded	412D	Sogn loam, 5 to 14 percent slopes
41E	Sparta loamy fine sand, 9 to 18 percent slopes	163G	Fayette silt loam, 25 to 40 percent slopes	420	Tama silt loam, benches, 0 to 2 percent slopes
42	Granby fine sandy loam, 0 to 2 percent slopes	163G3	Fayette silty clay loam, 25 to 40 percent slopes, severely eroded	420B	Tama silt loam, benches, 2 to 5 percent slopes
51	Vesser silt loam, 0 to 2 percent slopes	175	Dickinson fine sandy loam, 0 to 2 percent slopes	426B	Aredale loam, 2 to 5 percent slopes
54	Zook silty clay loam, 0 to 2 percent slopes	175B	Dickinson fine sandy loam, 2 to 5 percent slopes	[illegible]	Ely silt loam, 2 to 5 percent slopes
63C	Chelsea loamy fine sand, 5 to 9 percent slopes	175C	Dickinson fine sandy loam, 5 to 9 percent slopes	462	Downs silt loam, benches, 0 to 2 percent slopes
63E	Chelsea loamy fine sand, 9 to 18 percent slopes	175D	Dickinson fine sandy loam, 9 to 18 percent slopes	462B	Downs silt loam, benches, 2 to 5 percent slopes
63G	Chelsea loamy fine sand, 18 to 30 percent slopes	177	Saude loam, 0 to 2 percent slopes	462C	Downs silt loam, benches, 5 to 9 percent slopes
65E2	Lindley loam, 14 to 18 percent slopes, moderately eroded	177B	Saude loam, 2 to 5 percent slopes	463B	Fayette silt loam, benches, 2 to 5 percent slopes
65E3	Lindley clay loam, 14 to 18 percent slopes, severely eroded	177C	Saude loam, 5 to 9 percent slopes	478G	Rock outcrop–Nordness complex, 18 to 60 percent slopes
65F2	Lindley loam, 18 to 25 percent slopes, moderately eroded	178	Waukee loam, 0 to 2 percent slopes	499D	Nordness silt loam, 5 to 14 percent slopes
65F3	Lindley clay loam, 18 to 25 percent slopes, severely eroded	178B	Waukee loam, 2 to 5 percent slopes	499F	Nordness silt loam, 14 to 25 percent slopes
65G	Lindley loam, 25 to 40 percent slopes	179D2	Gara loam, 9 to 14 percent slopes, moderately eroded	591B	Clyde–Schley complex, 1 to 4 percent slopes
65G3	Lindley clay loam, 25 to 40 percent slopes, severely eroded	184	Klinger silt loam, 1 to 3 percent slopes	662C2	Mt. Carroll silt loam, 5 to 9 percent slopes, moderately eroded
83B	Kenyon loam, 2 to 5 percent slopes	213B	Rockton loam, 30 to 40 inches to limestone, 2 to 5 percent slopes	662D2	Mt. Carroll silt loam, 9 to 14 percent slopes, moderately eroded
83C	Kenyon loam, 5 to 9 percent slopes	214B	Rockton loam, 20 to 30 inches to limestone, 2 to 5 percent slopes	662E2	Mt. Carroll silt loam, 14 to 18 percent slopes, moderately eroded
83C2	Kenyon loam, 5 to 9 percent slopes, moderately eroded	214C	Rockton loam, 20 to 30 inches to limestone, 5 to 9 percent slopes	688	Koszta silt loam, 0 to 2 percent slopes
84	Clyde silty clay loam, 0 to 2 percent slopes	216B	Ripon silt loam, 20 to 30 inches to limestone, 2 to 5 percent slopes	727	Udolpho loam, 32 to 40 inches to sand and gravel, 0 to 2 percent slopes
88	Nevin silty clay loam, 0 to 2 percent slopes	216C	Ripon silt loam, 20 to 30 inches to limestone, 5 to 9 percent slopes	728	Udolpho loam, 24 to 32 inches to sand and gravel, 0 to 2 percent slopes
110C	Lamont fine sandy loam, 3 to 8 percent slopes	217B	Ripon silt loam, 30 to 40 inches to limestone, 2 to 5 percent slopes	733	Calco silty clay loam, 0 to 2 percent slopes
118	Garwin silty clay loam, 0 to 2 percent slopes	217C	Ripon silt loam, 30 to 40 inches to limestone, 5 to 9 percent slopes	760	Ansgar silt loam, 0 to 3 percent slopes
119	Muscatine silt loam, 1 to 3 percent slopes	221	Palms muck, 0 to 3 percent slopes	777B	Wapsie loam, 2 to 5 percent slopes
120	Tama silt loam, 0 to 2 percent slopes	226	Lawler loam, 32 to 40 inches to sand and gravel, 0 to 2 percent slopes	777C	Wapsie loam, 5 to 9 percent slopes
120B	Tama silt loam, 2 to 5 percent slopes	249	Zwingle silt loam, 0 to 2 percent slopes	[illegible]	Bertram sandy loam, 2 to 7 percent slopes
120C	Tama silt loam, 5 to 9 percent slopes	249B	Zwingle silt loam, 2 to 5 percent slopes	918	Garwin silty clay loam, sandy substratum, 0 to 2 percent slopes
120C2	Tama silt loam, 5 to 9 percent slopes, moderately eroded	284B	Flagler sandy loam, 1 to 5 percent slopes	919	Muscatine silt loam, sandy substratum, 0 to 2 percent slopes
120D	Tama silt loam, 9 to 14 percent slopes	284C	Flagler sandy loam, 5 to 9 percent slopes	920	Tama silt loam, sandy substratum, 0 to 2 percent slopes
120D2	Tama silt loam, 9 to 14 percent slopes, moderately eroded	285B	Burkhardt sandy loam, 2 to 5 percent slopes	[illegible]	Tama silt loam, sandy substratum, 2 to 5 percent slopes
133	Colo silty clay loam, 0 to 2 percent slopes	285D	Burkhardt sandy loam, 5 to 14 percent slopes	923	Coyne fine sandy loam, 0 to 2 percent slopes
133+	Colo silt loam, overwash, 0 to 2 percent slopes	285F2	Burkhardt sandy loam, 14 to 25 percent slopes, moderately eroded	933	Sawmill silty clay loam, 0 to 2 percent slopes
142	Chaseburg silt loam, 0 to 2 percent slopes	291	Atterberry silt loam, 1 to 3 percent slopes	949	Zwingle Variant silty clay, 0 to 2 percent slopes
142B	Chaseburg silt loam, 2 to 5 percent slopes	293E	Chelsea–Lamont–Fayette complex, 9 to 20 percent slopes	951F	Medary silt loam, 18 to 30 percent slopes
143	Brady sandy loam, 1 to 3 percent slopes	315	Fluvents–Ambraw complex, 0 to 2 percent slopes	953	Darwin Variant silty clay, 0 to 2 percent slopes
152	Marshan clay loam, 32 to 40 inches to sand and gravel, 0 to 2 percent slopes	350	Waukegan silt loam, 0 to 2 percent slopes	960	Shaffton loam, 0 to 2 percent slopes
159	Finchford loamy sand, 0 to 2 percent slopes	350B	Waukegan silt loam, 2 to 5 percent slopes	961	Ambraw silty clay loam, 0 to 2 percent slopes
159C	Finchford loamy sand, 2 to 9 percent slopes	350C	Waukegan silt loam, 5 to 9 percent slopes	962	Elvira silty clay loam, 0 to 2 percent slopes
160	Walford silt loam, 0 to 1 percent slopes	351	Atterberry silt loam, sandy substratum, 0 to 2 percent slopes	963	Elvers silt loam, 0 to 2 percent slopes
162B	Downs silt loam, 2 to 5 percent slopes	352B	Whittier silt loam, 2 to 5 percent slopes	976	Raddle silt loam, 0 to 2 percent slopes
162C	Downs silt loam, 5 to 9 percent slopes	353	Tell silt loam, 0 to 2 percent slopes	1118	Garwin silty clay loam, benches, 0 to 2 percent slopes
162C2	Downs silt loam, 5 to 9 percent slopes, moderately eroded	353B	Tell silt loam, 2 to 5 percent slopes	1119	Muscatine silt loam, benches, 1 to 3 percent slopes
162D	Downs silt loam, 9 to 14 percent slopes	353C	Tell silt loam, 5 to 9 percent slopes	1142	Chaseburg silt loam, channeled, 0 to 2 percent slopes
162D2	Downs silt loam, 9 to 14 percent slopes, moderately eroded	354	Aquolls, ponded	1160	Walford silt loam, benches, 0 to 1 percent slopes
162E2	Downs silt loam, 14 to 18 percent slopes, moderately eroded	373E2	Timula silt loam, 12 to 20 percent slopes, moderately eroded	1291	Atterberry silt loam, benches, 1 to 3 percent slopes
163B	Fayette silt loam, 2 to 5 percent slopes	377B	Dinsdale silt loam, 2 to 5 percent slopes	1777	Wapsie Variant loam, 0 to 2 percent slopes
163C	Fayette silt loam, 5 to 9 percent slopes	377C	Dinsdale silt loam, 5 to 9 percent slopes	1954	Darwin silty clay, bedrock substratum, 0 to 2 percent slopes
163C2	Fayette silt loam, 5 to 9 percent slopes, moderately eroded	382	Maxfield silty clay loam, 0 to 2 percent slopes	5010	Pits, gravel
163D2	Fayette silt loam, 9 to 14 percent slopes, moderately eroded	399	Readlyn loam, 1 to 3 percent slopes	5030	Pits, quarries
163D3	Fayette silty clay loam, 9 to 14 percent slopes, severely eroded	404	Thorp silt loam, 0 to 2 percent slopes	5040	Orthents, loamy
163E2	Fayette silt loam, 14 to 18 percent slopes, moderately eroded	407B	Schley loam, 1 to 4 percent slopes		

CLINTON COUNTY, IOWA — SHEET NUMBER 1



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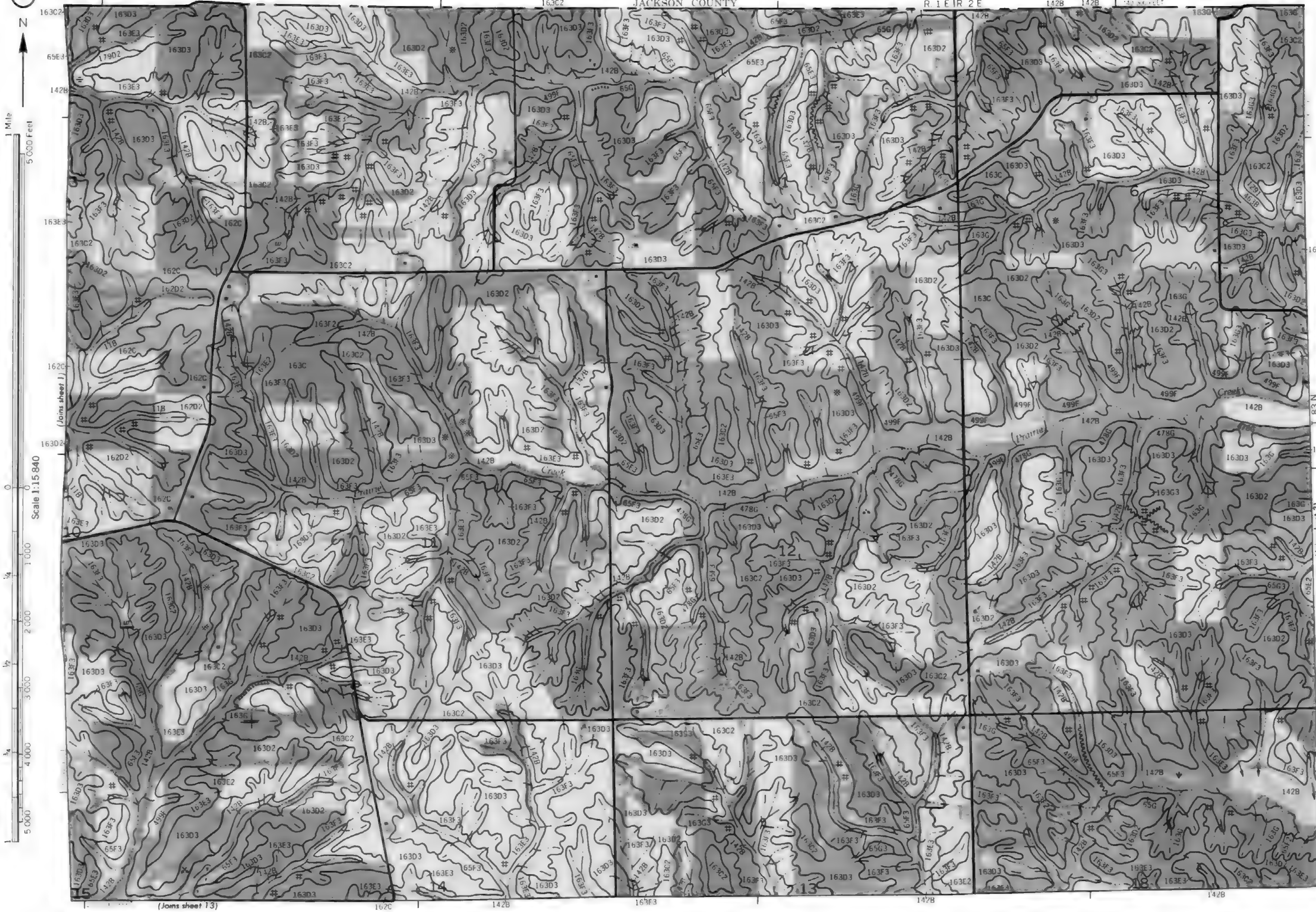

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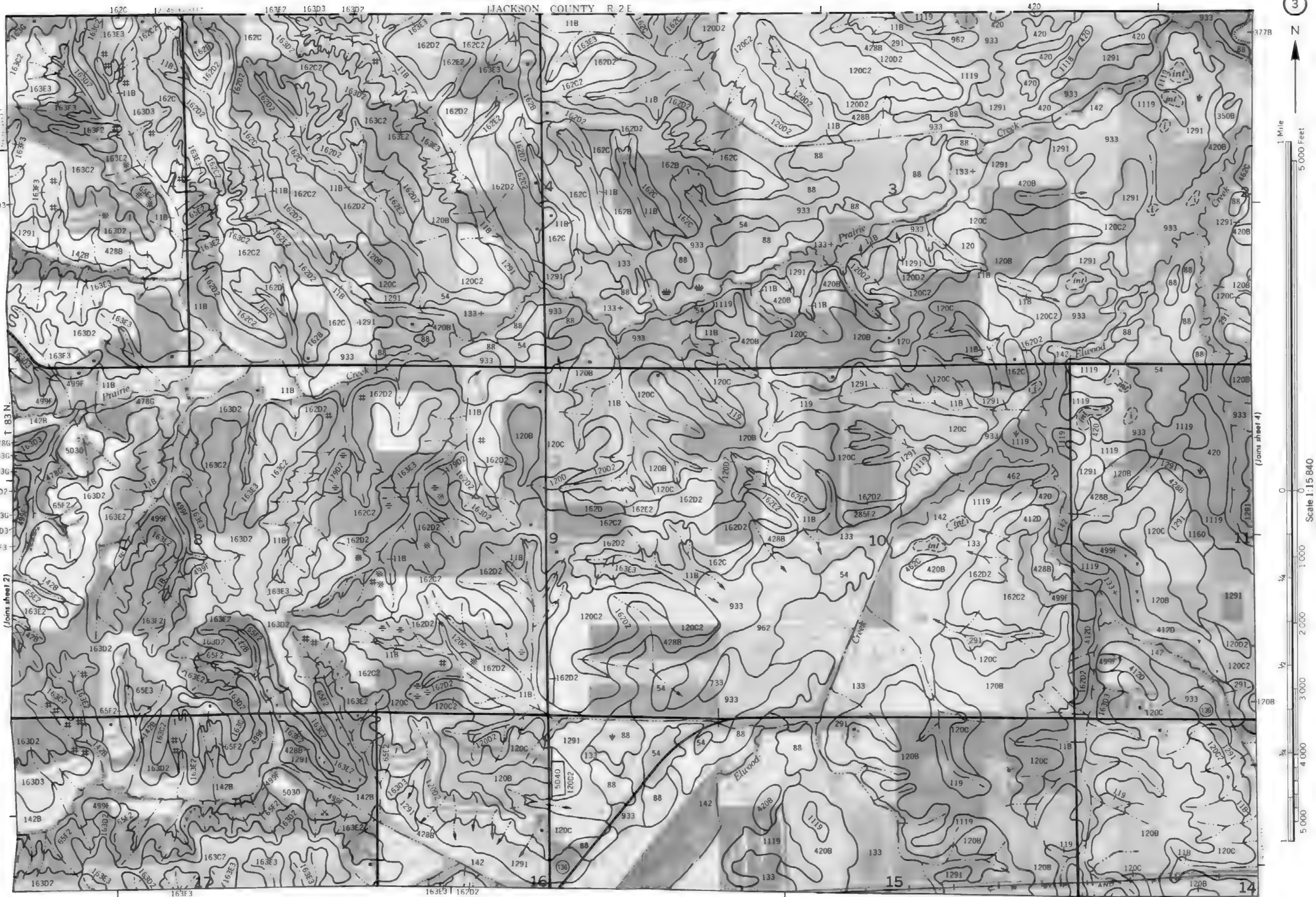

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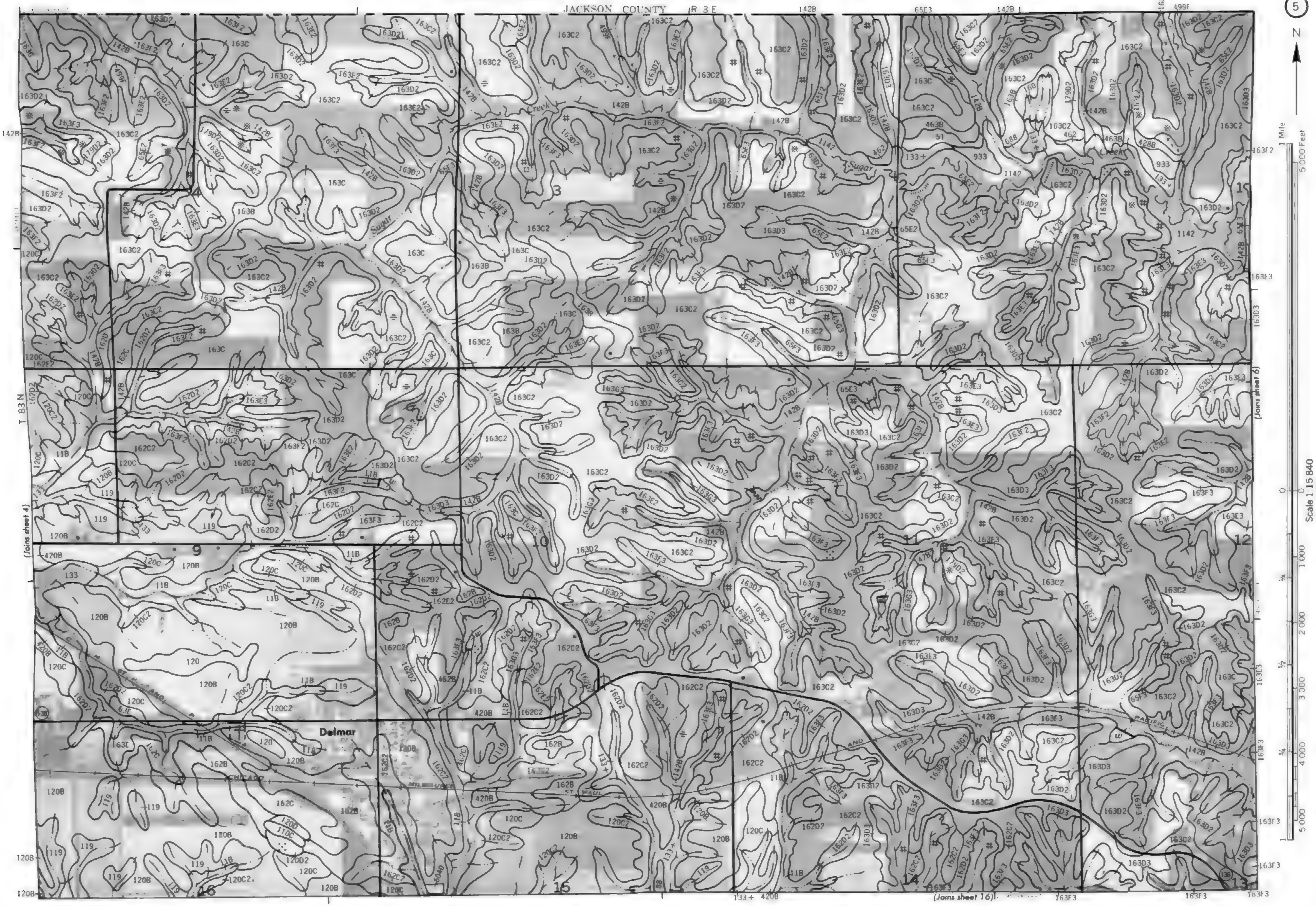
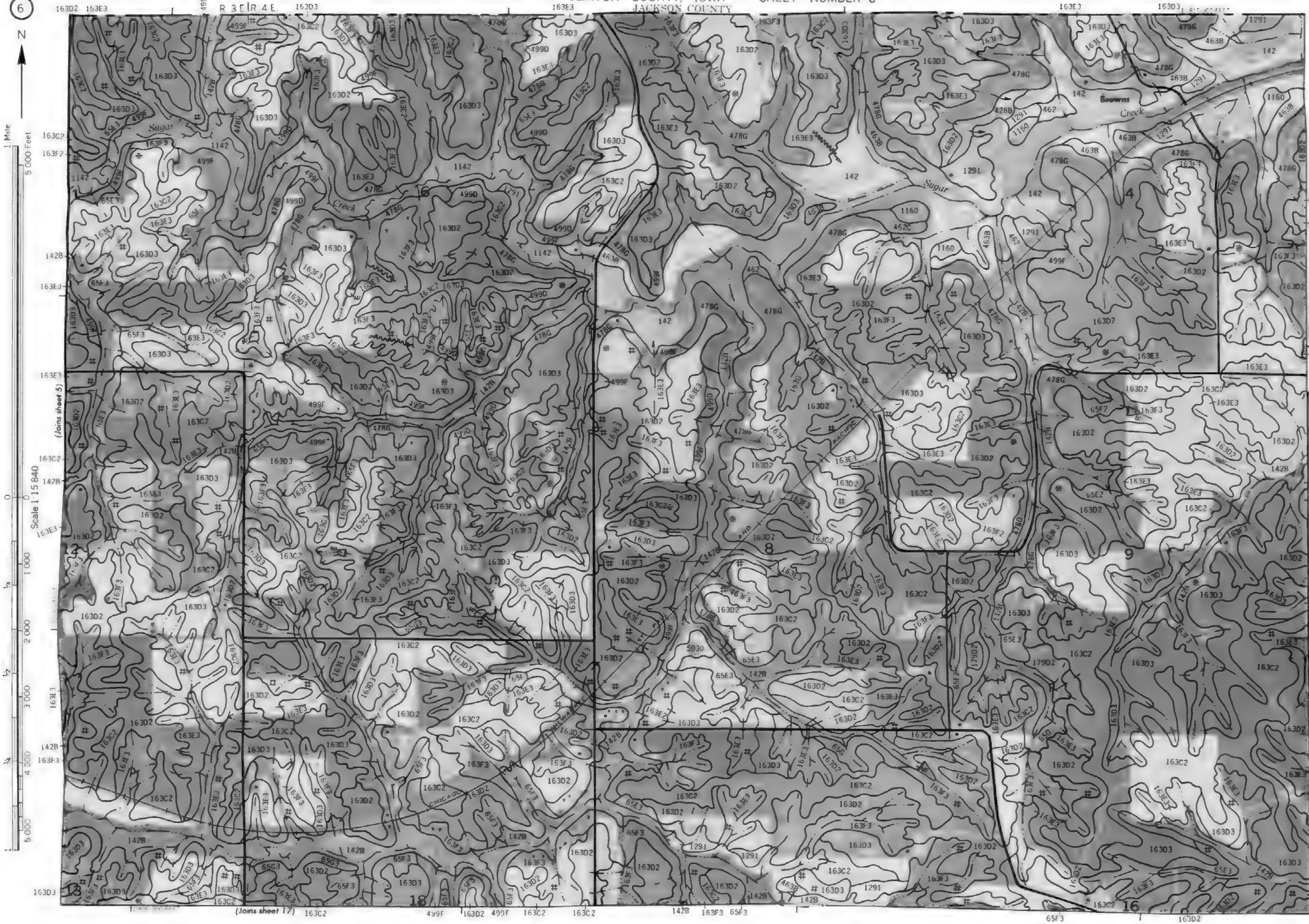
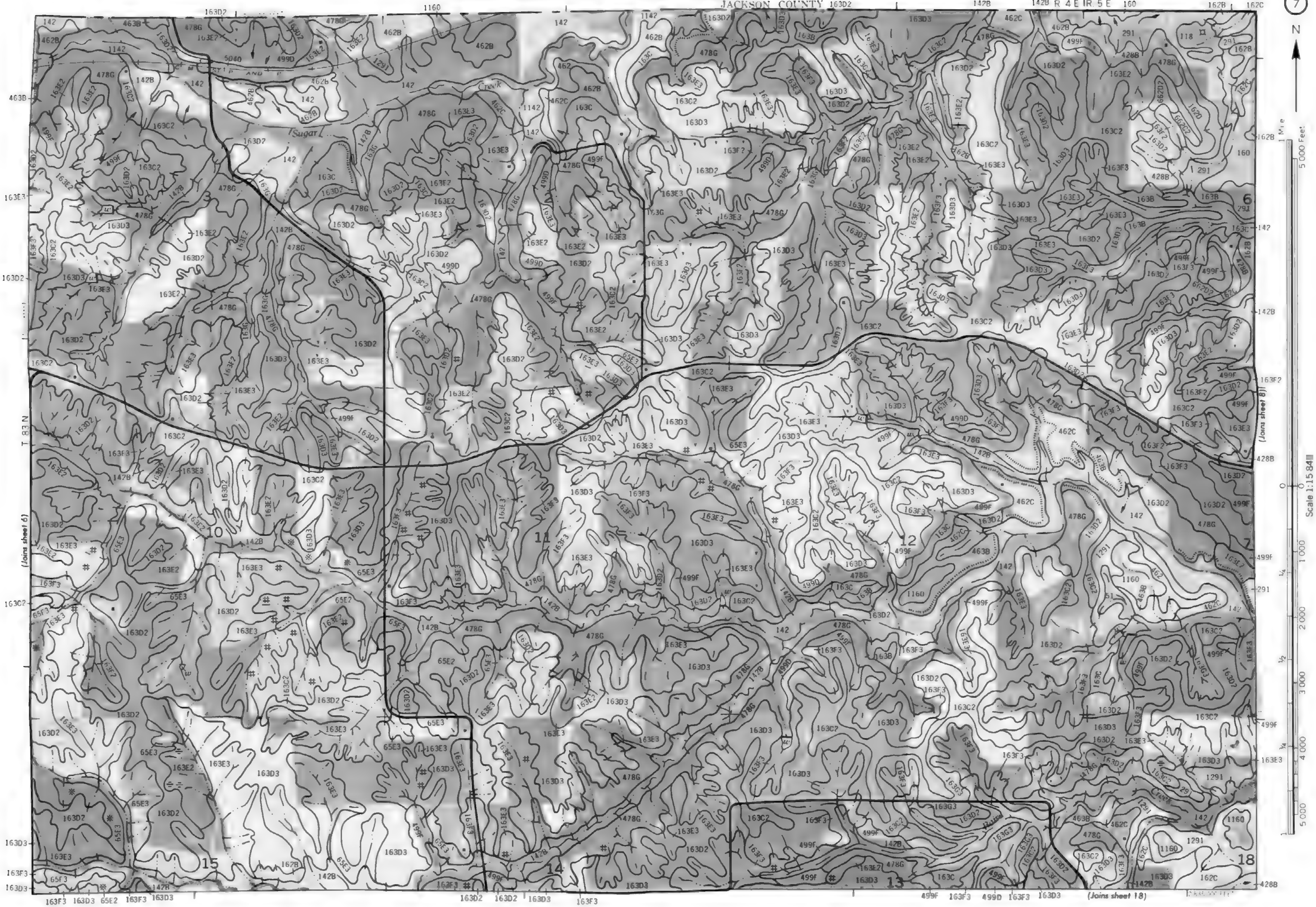
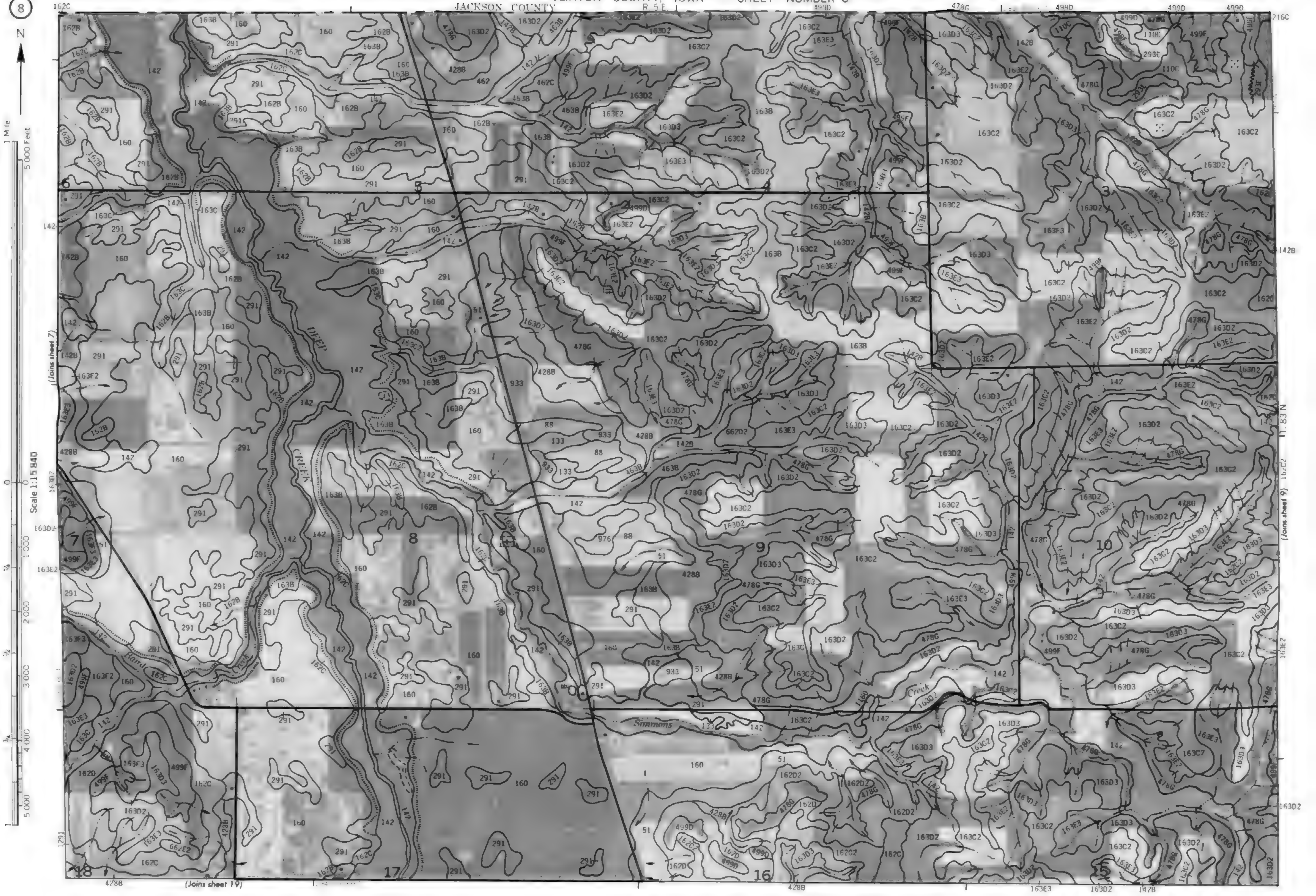
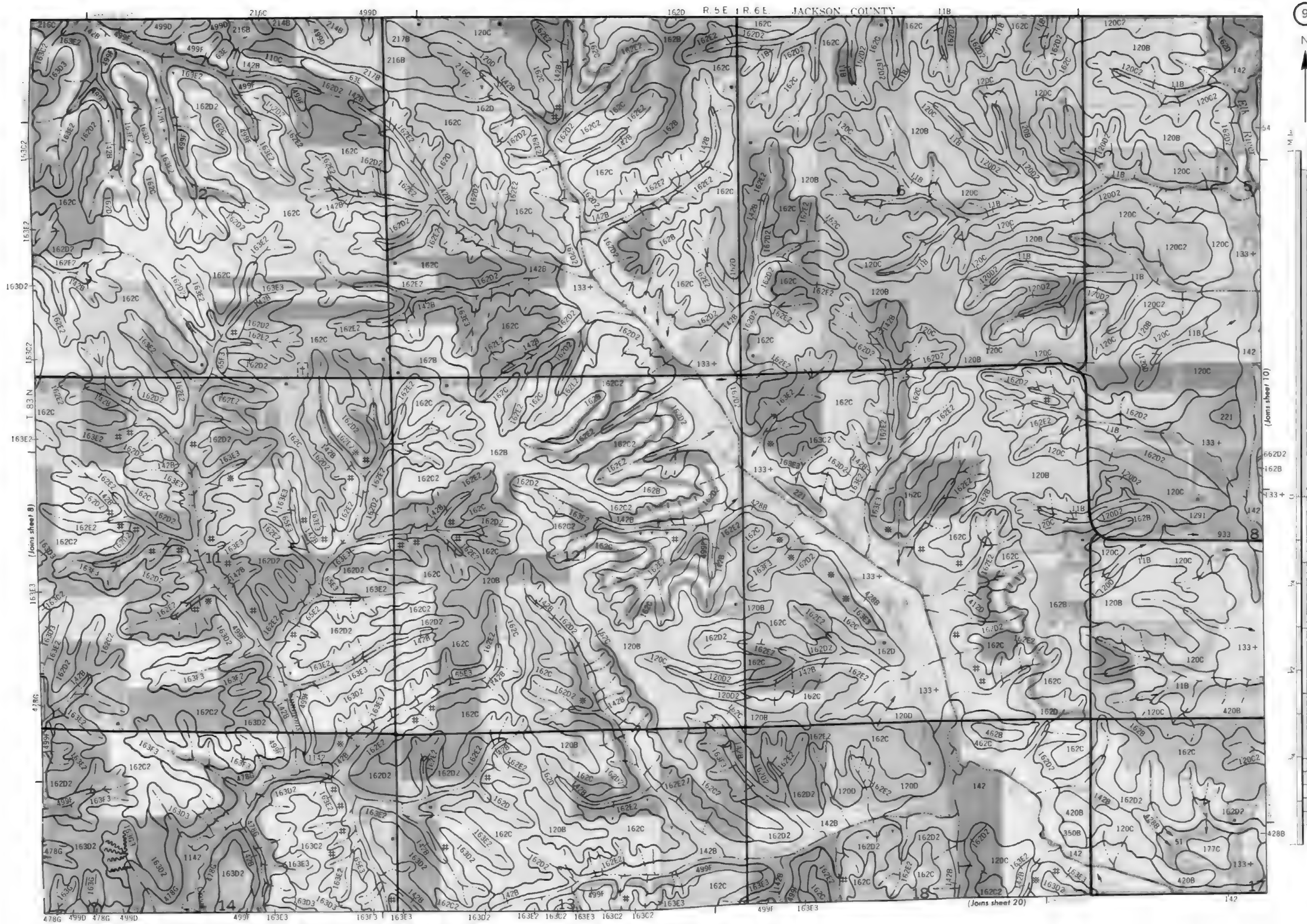



N
JACKSON COUNTY
R 3 E | R 4 E
T 83 N
Sugar Creek
Browns Creek
(Joins sheet 5)
(Joins sheet 7)
(Joins sheet 17)
CHICAGO
PACIFIC
1 Mile
5 000 Feet
Scale 1:15 840
0
1000
2000
3000
4000
5000
½
¼
¾
4
5
6
7
8
9
12
13
16
17
18

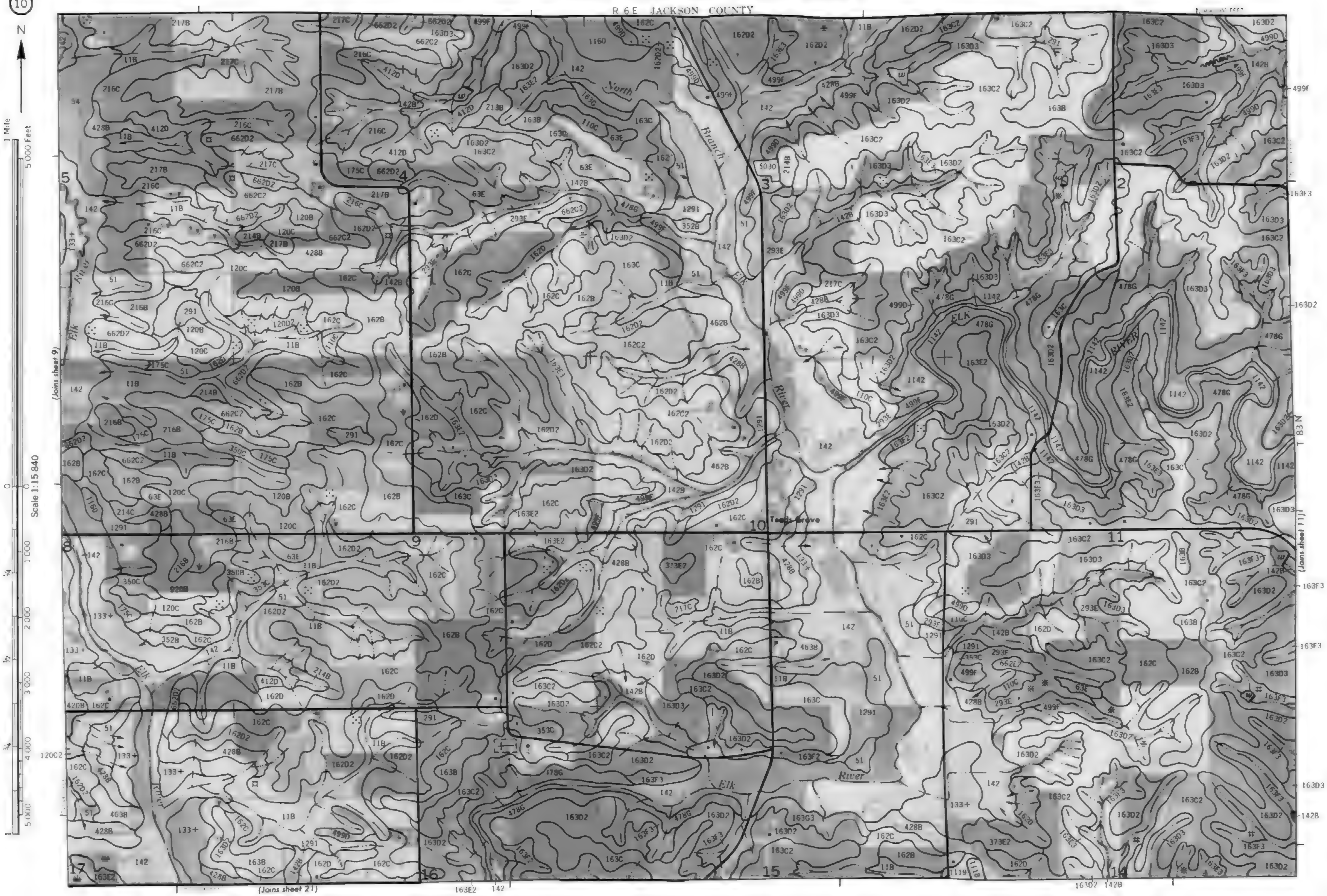

7
JACKSON COUNTY
R 4 E | R 5 E
N
T 83 N
(Joins sheet 6)
(Joins sheet 8)
(Joins sheet 18)
Sugar Creek
1 Mile
5 000 Feet
Scale 1:15 840
0
1/4
1/2
3/4
1
1000
2000
3000
4000
5000
6
7
10
11
12
13
14
15
18

CLINTON COUNTY, IOWA — SHEET NUMBER 8

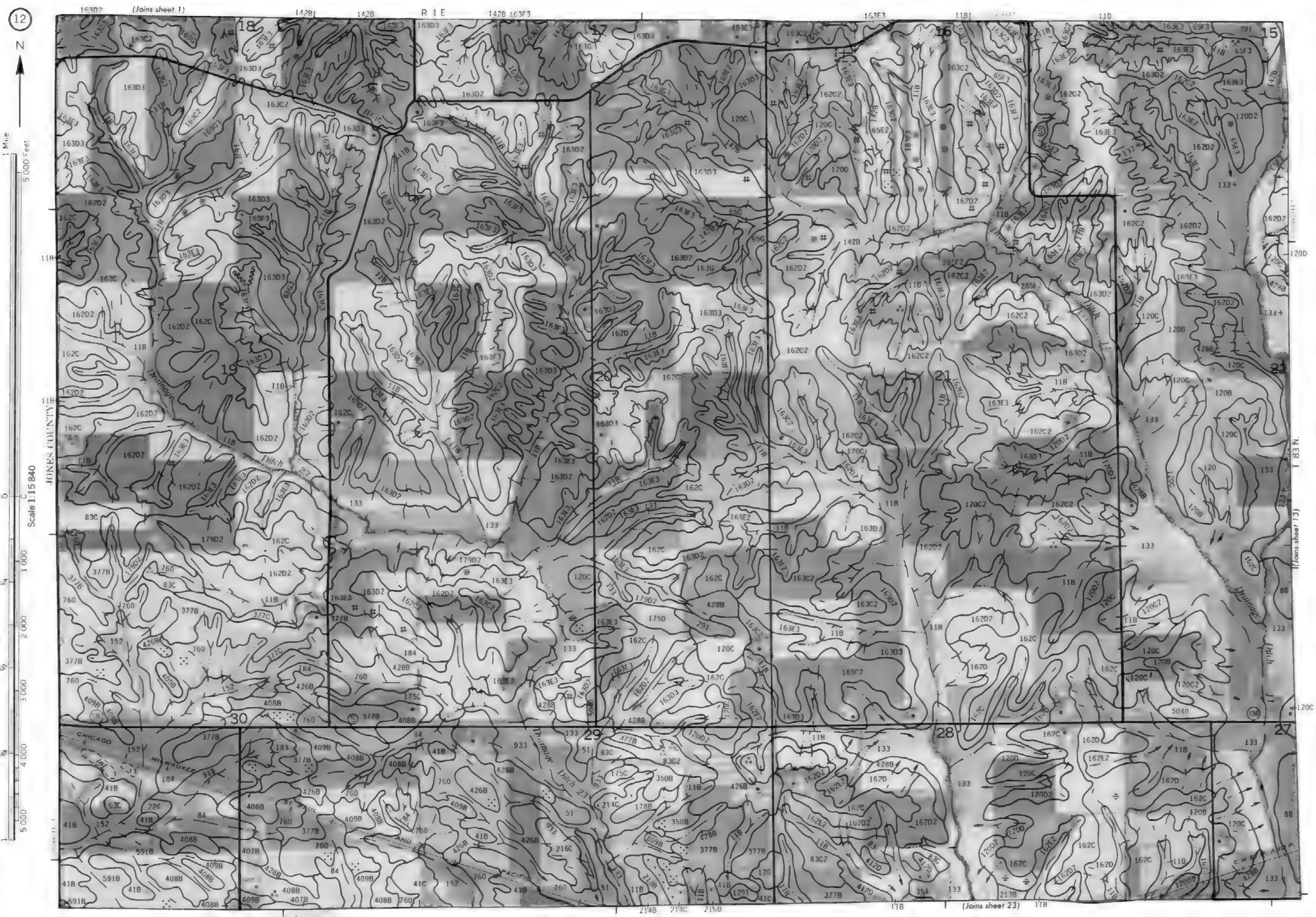



R.5E | R.6E
JACKSON COUNTY
N
T.83 N
(Joins sheet 8)
(Joins sheet 10)
(Joins sheet 20)
Scale 1:15 840
1 Mile
5000 Feet
0
1 000
2 000
3 000
4 000
5 000

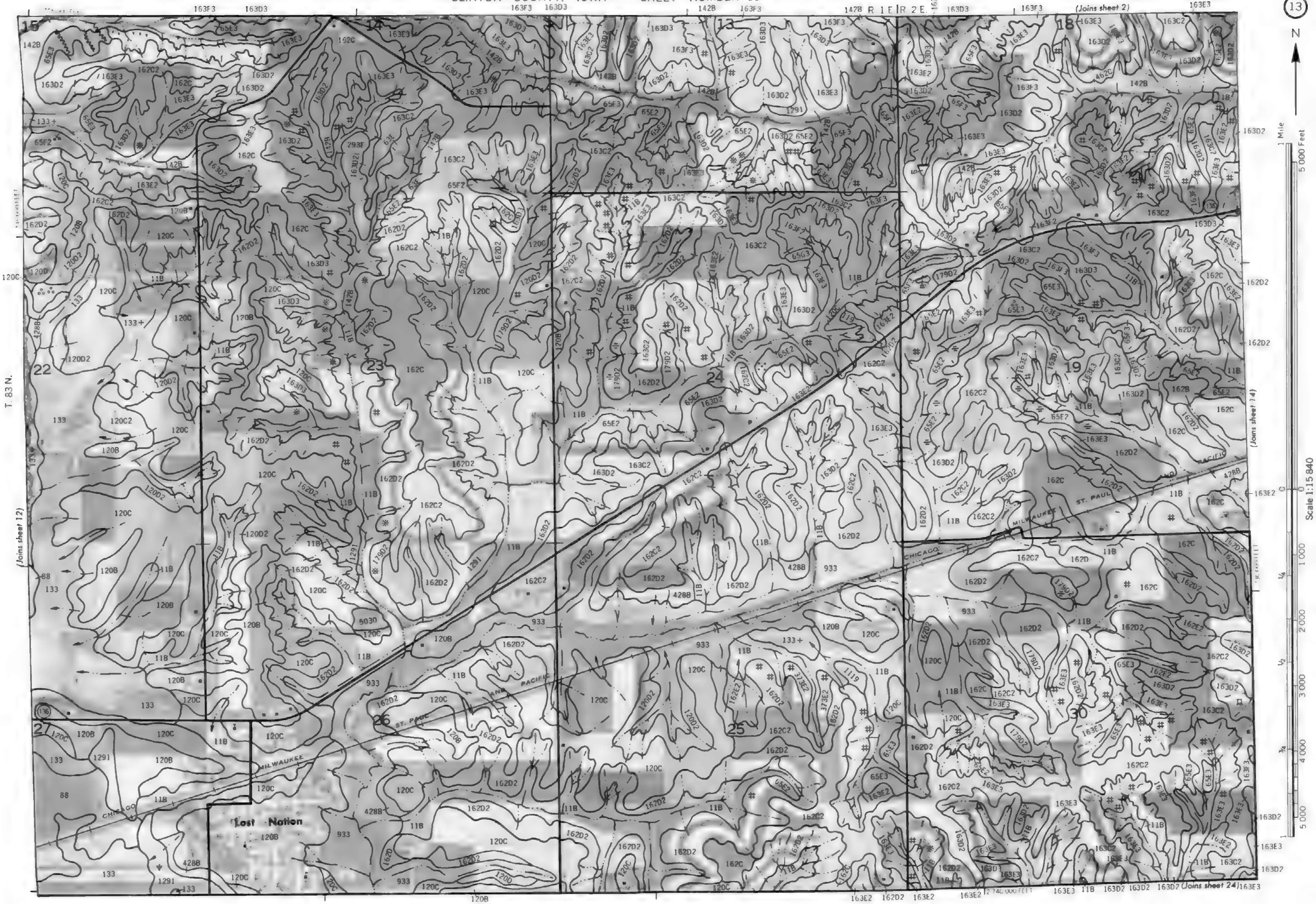
CLINTON COUNTY, IOWA — SHEET NUMBER 10



11
N
R.6E. R.7E.
JACKSON COUNTY
T. 83 N.
(Joins sheet 10)
(Joins sheet 22)
Scrambling
Creek
ELK
RIVER
Hauntown
MISSISSIPPI
RIVER
CARROLL COUNTY
ILLINOIS
LIMIT OF SOIL SURVEY
Scale 1:15 840
1 Mile
5 000 Feet


12
N
(Joins sheet 1)
R 1 E
JONES COUNTY
1 Mile
5 000 Feet
Scale 1:15 840
T 83 N.
(Joins sheet 13)
(Joins sheet 23)
CHICAGO
MILWAUKEE
PACIFIC
Drainage Ditch 23
Ditch
18
17
16
15
19
20
21
22
30
29
28
27

CLINTON COUNTY, IOWA — SHEET NUMBER 13



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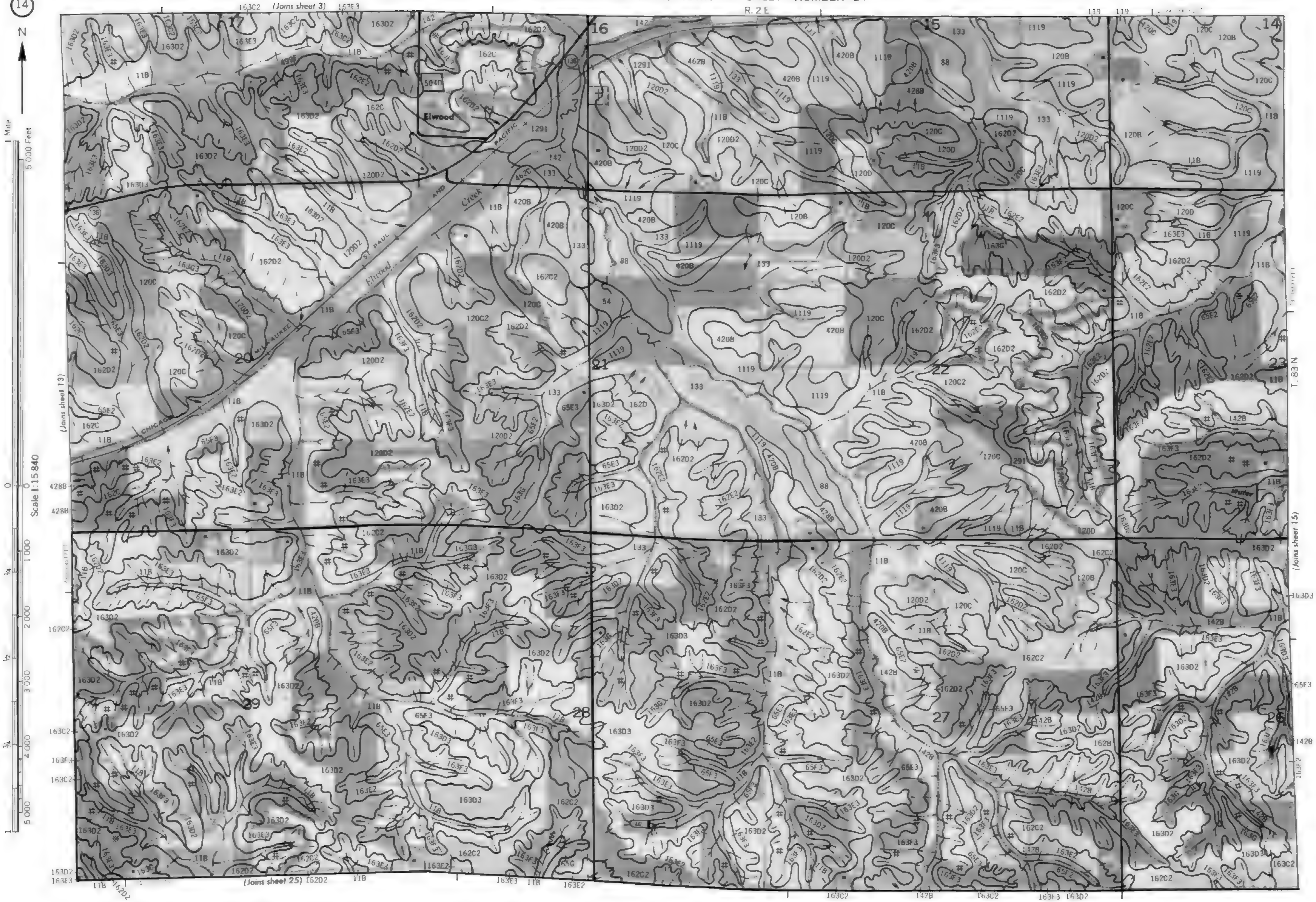

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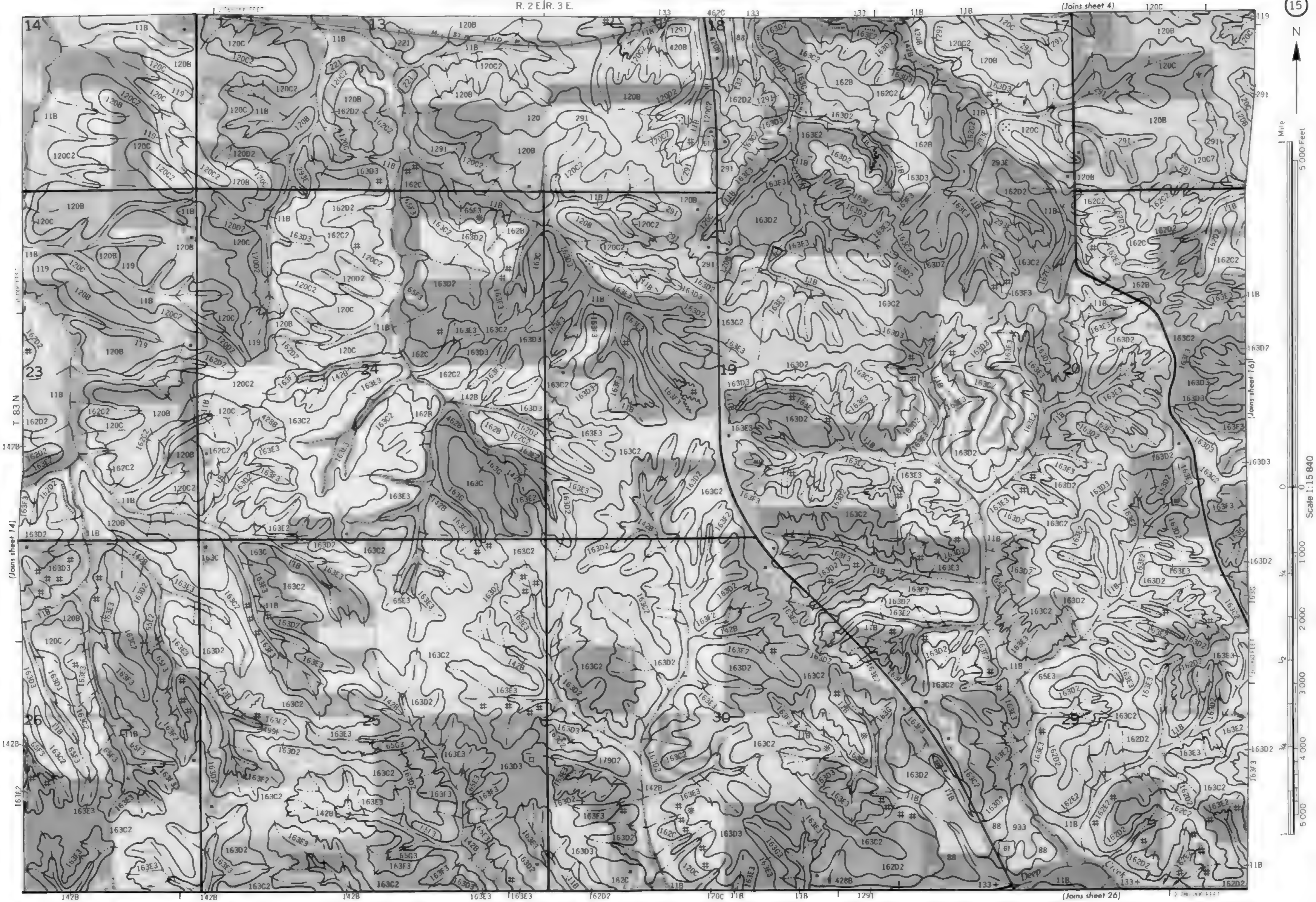
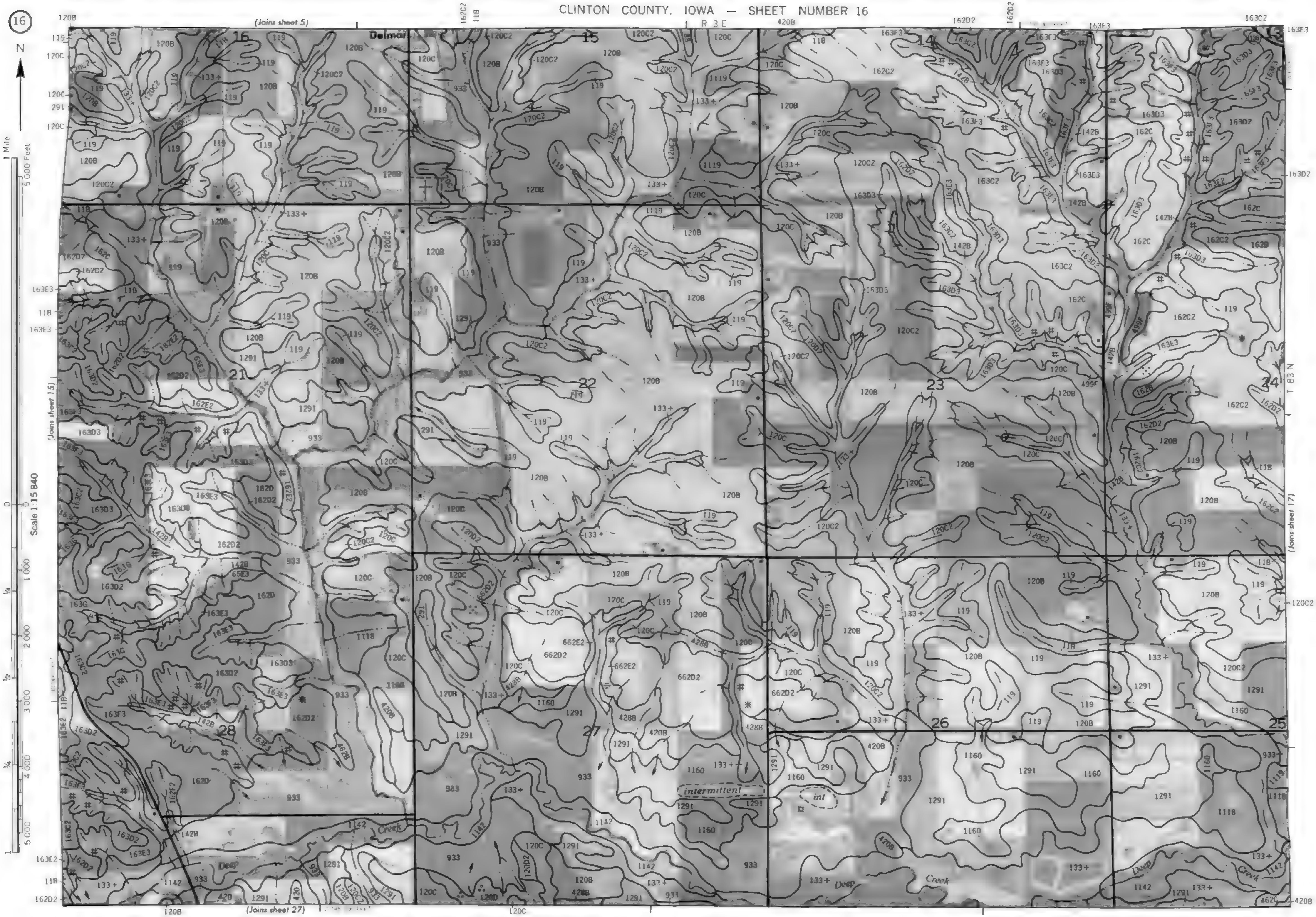
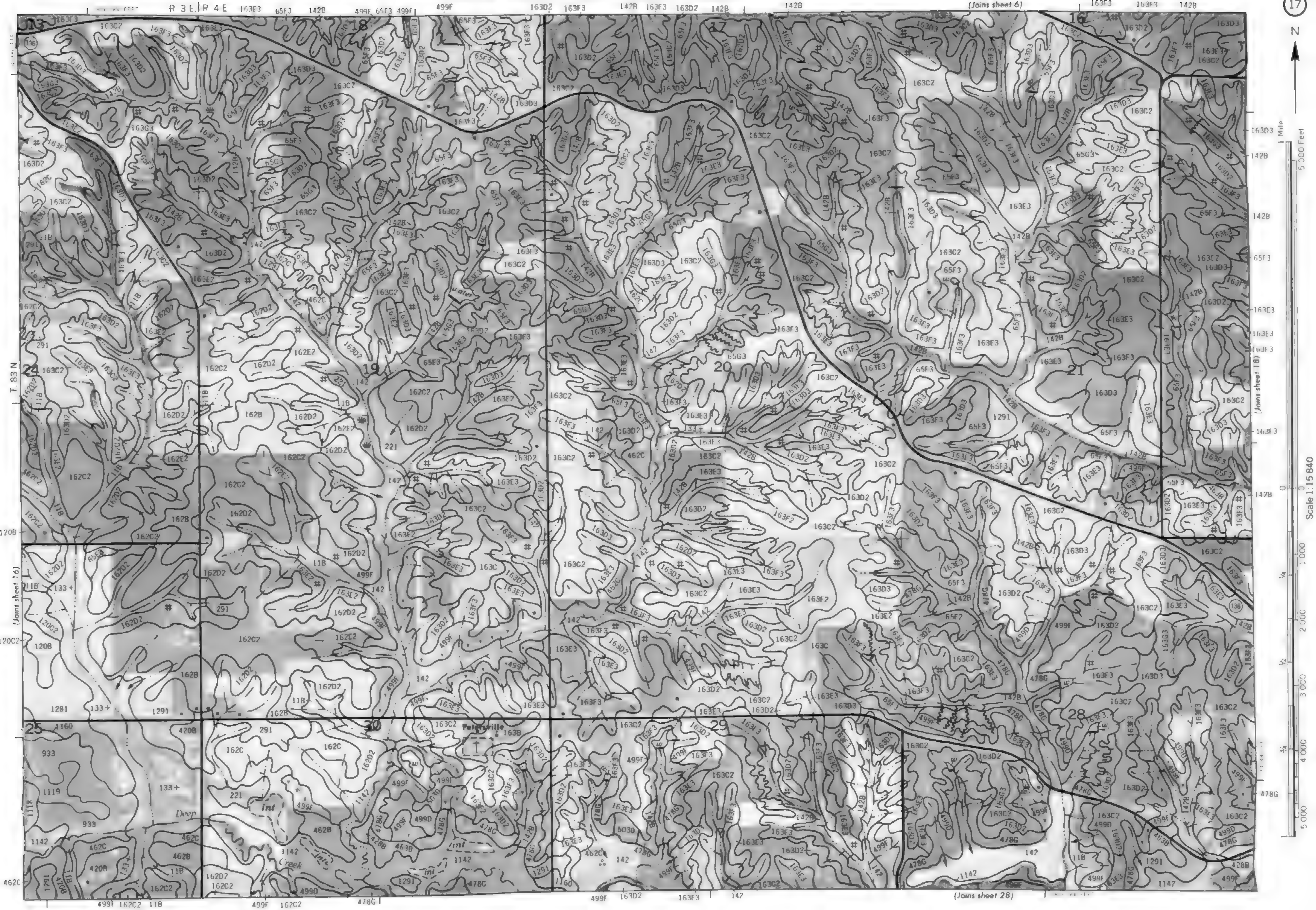
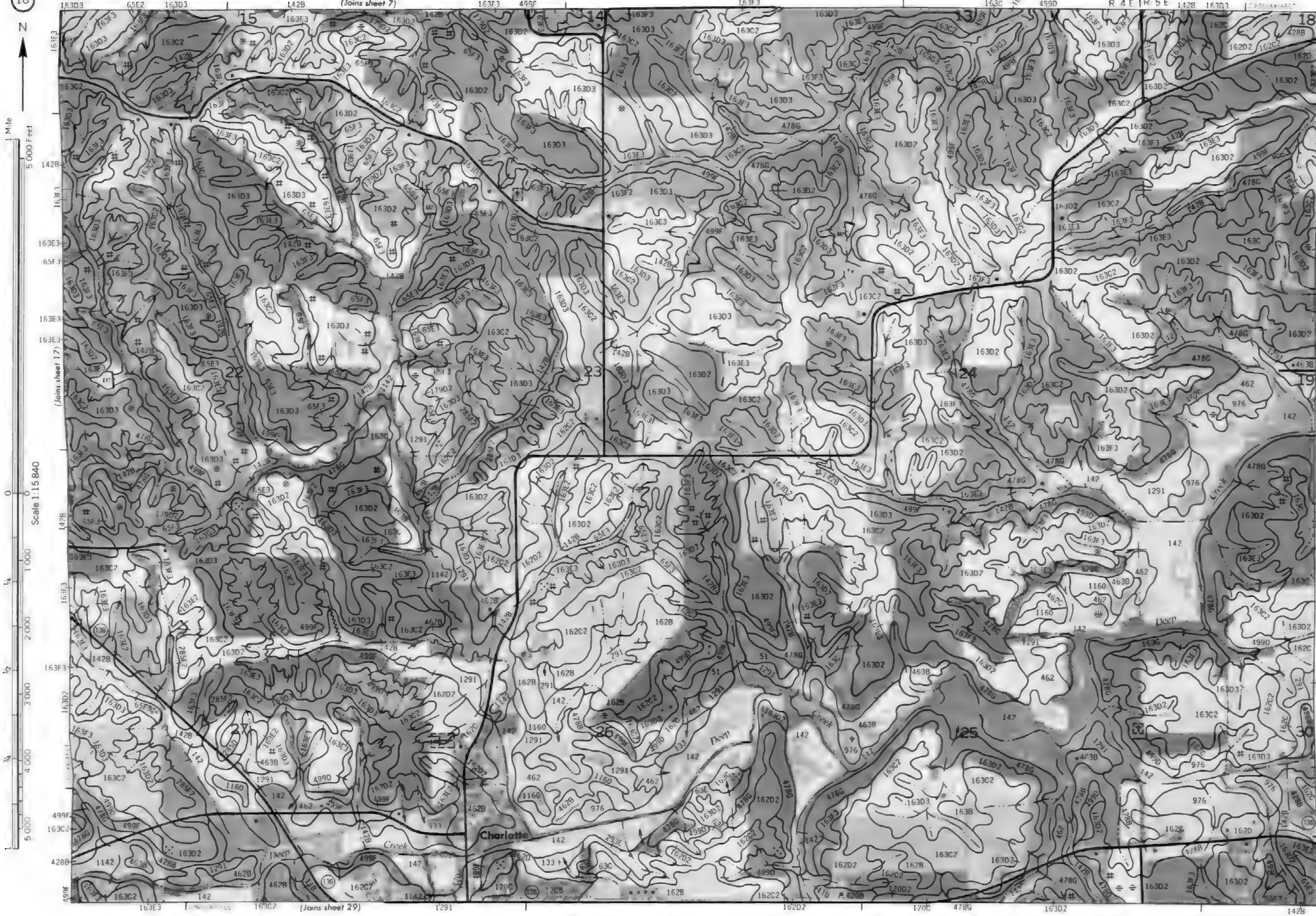
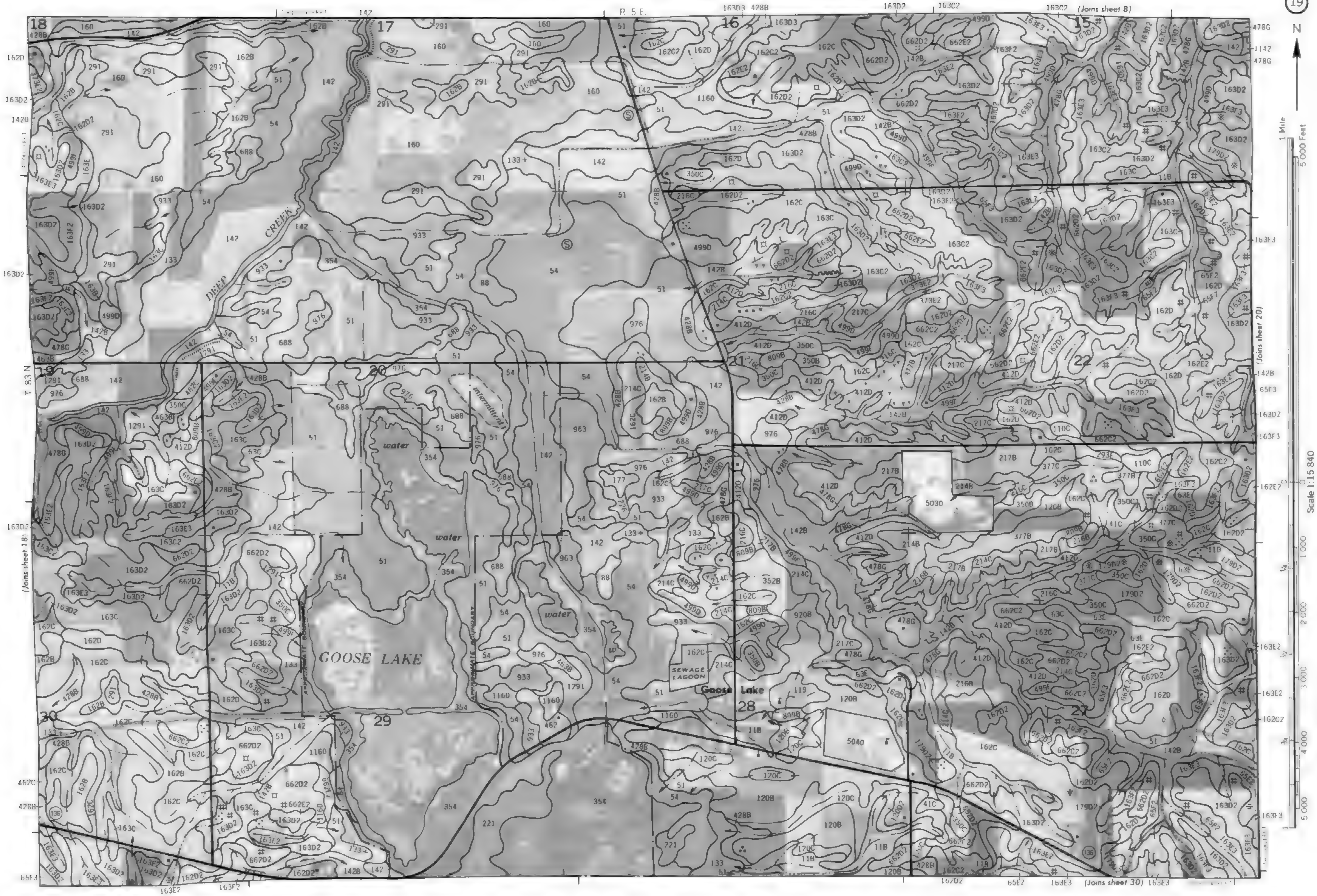



16
N
(Joins sheet 5)
(Joins sheet 15)
(Joins sheet 17)
(Joins sheet 27)
R 3 E
T 83 N
Delmar
Deep Creek
intermittent
Scale 1:15 840
1 Mile
5 000 Feet

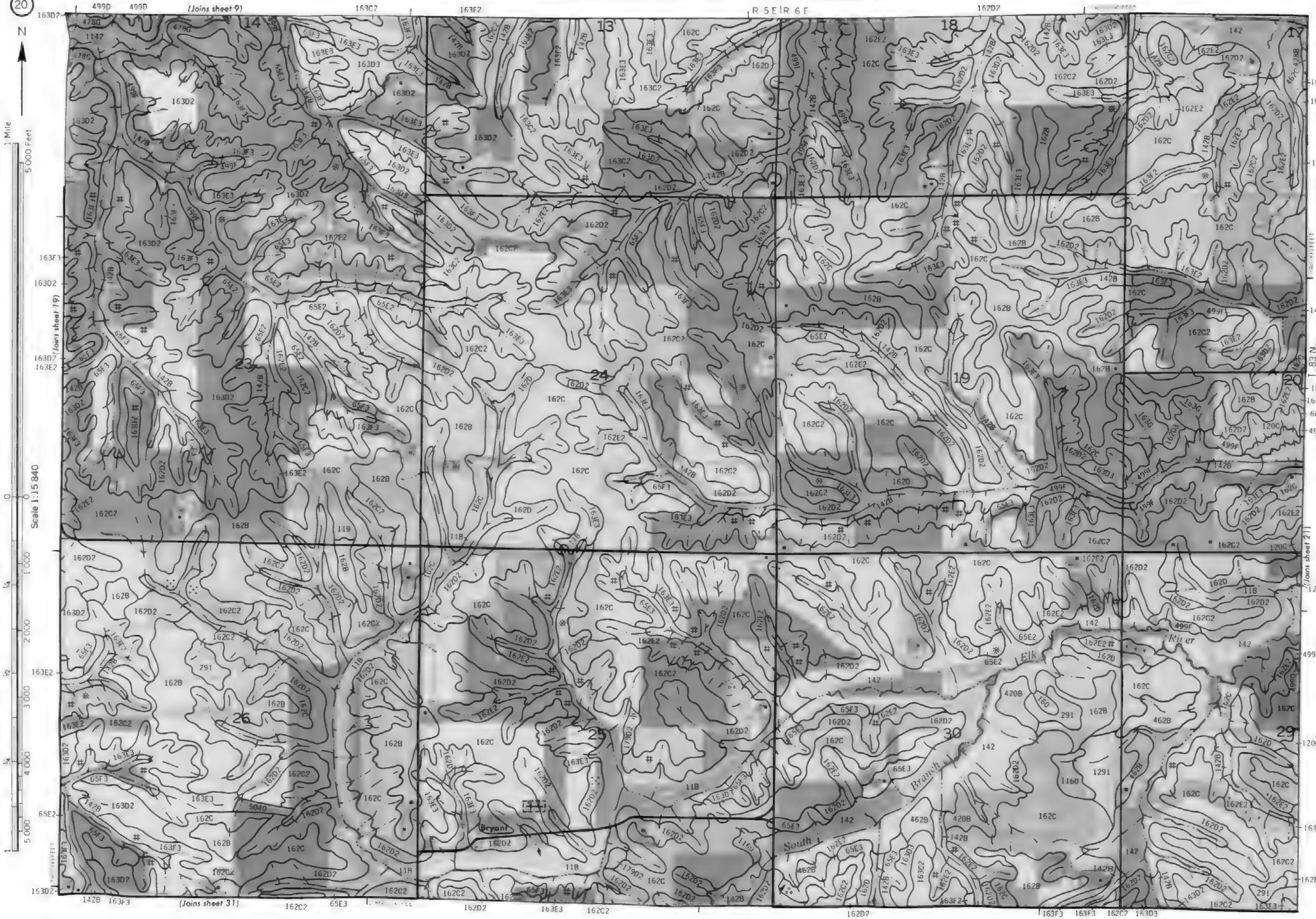
CLINTON COUNTY, IOWA — SHEET NUMBER 17




N
1 Mile
5 000 Feet
Scale 1:15 840
(Joins sheet 7)
(Joins sheet 17)
(Joins sheet 19)
(Joins sheet 29)
R 4 E | R 5 E
T. 83 N.
Charlotte
Deep Creek
15
14
13
18
22
23
24
19
27
26
25
30


(Joins sheet 8)
(Joins sheet 20)
(Joins sheet 30)
(Joins sheet 18)
R 5 E.
T 83 N
N
1 Mile
5 000 Feet
Scale 1:15 840
18
17
16
15
19
20
21
22
30
29
28
27
DEEP CREEK
GOOSE LAKE
water
intermittent
APPROXIMATE BOUNDARY
SEWAGE LAGOON
Goose Lake

CLINTON COUNTY, IOWA — SHEET NUMBER 20



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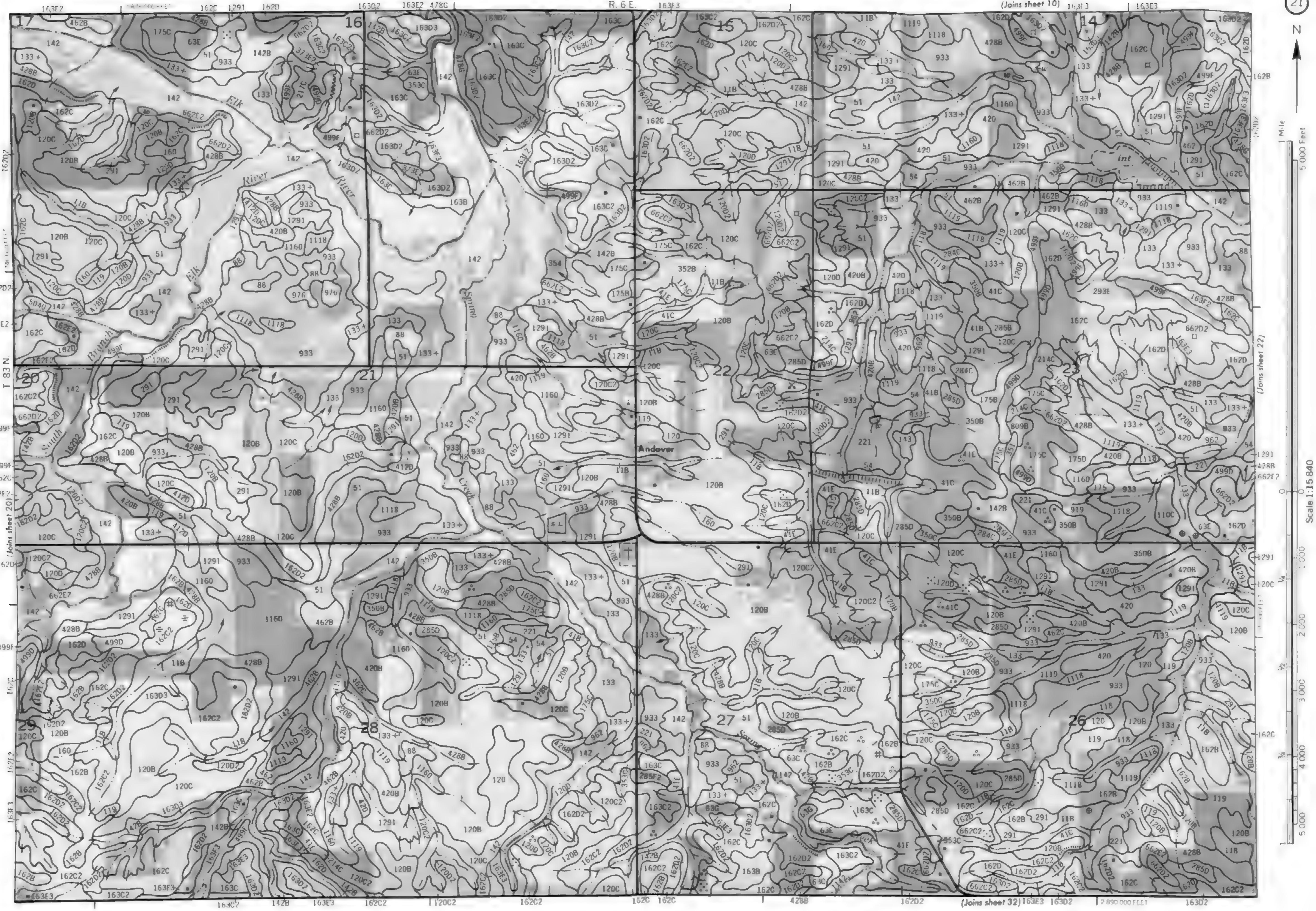
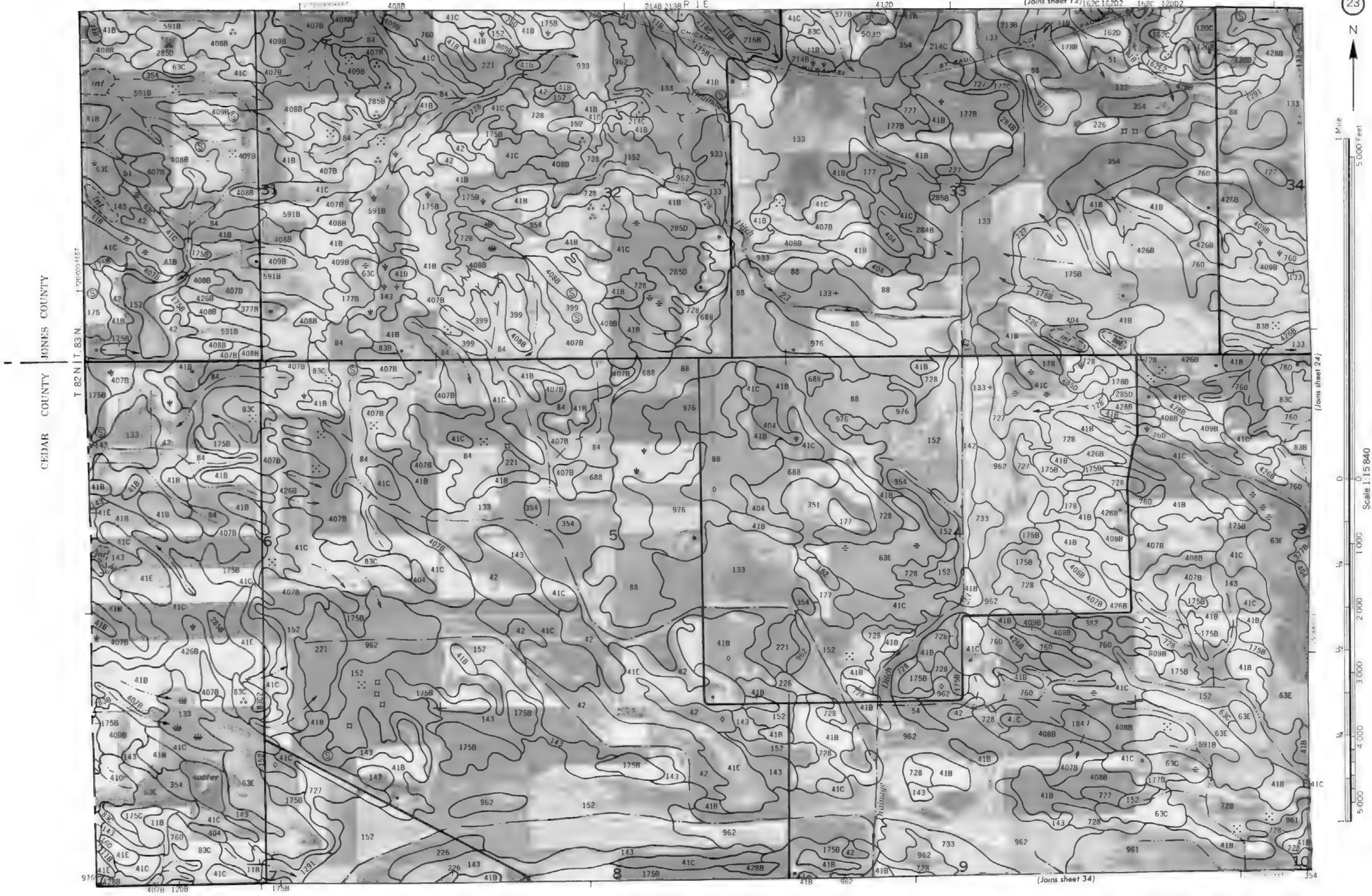
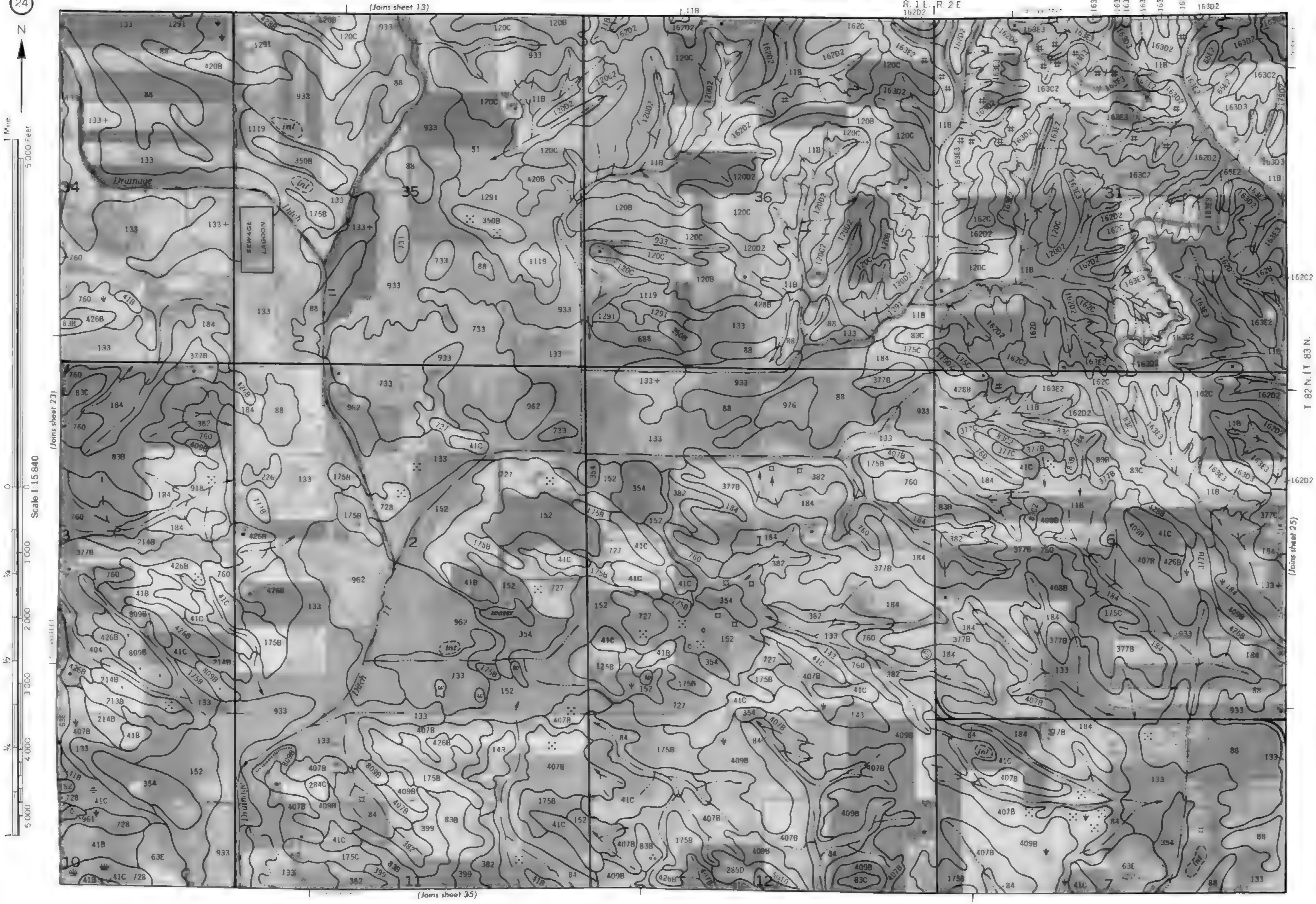
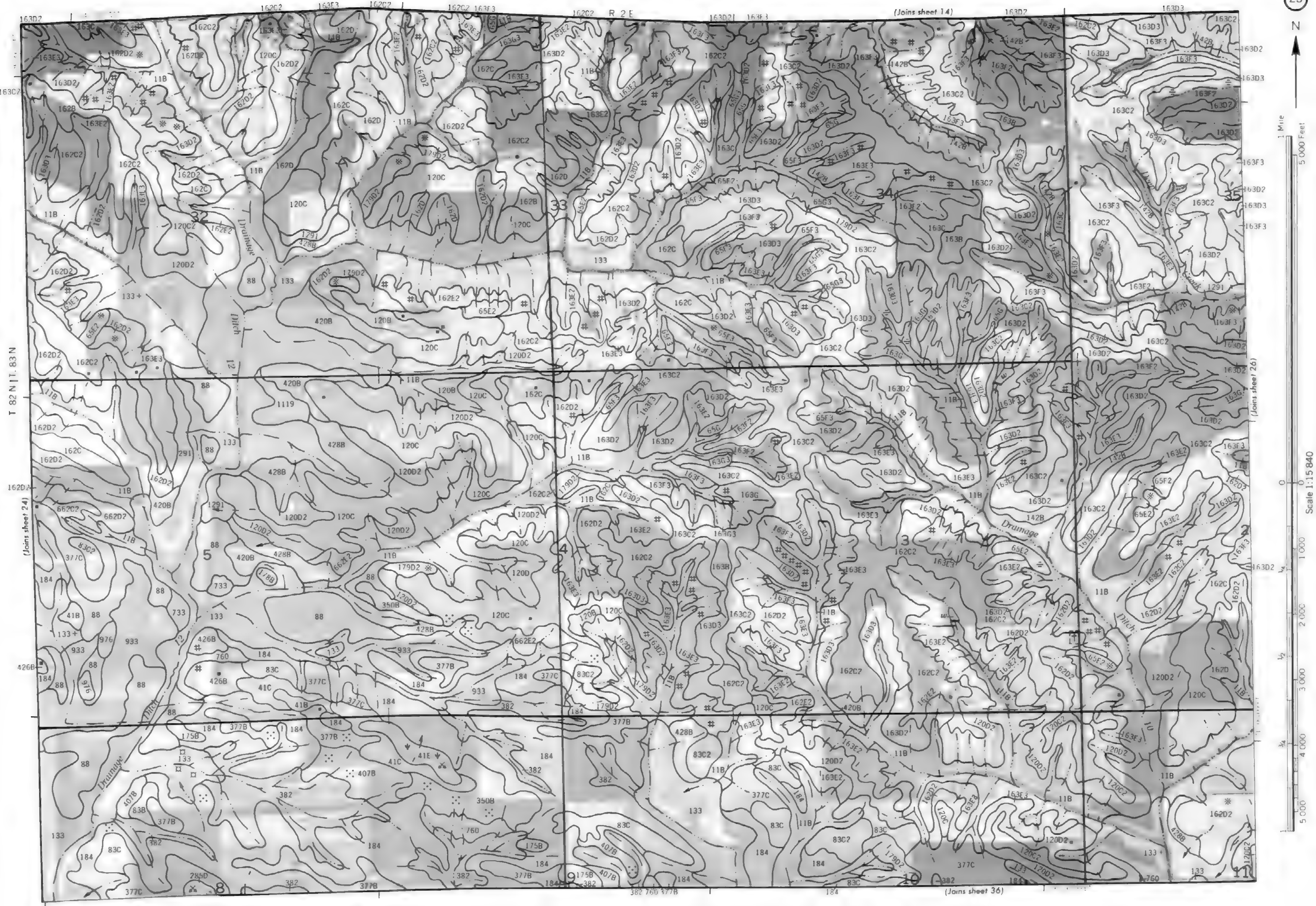


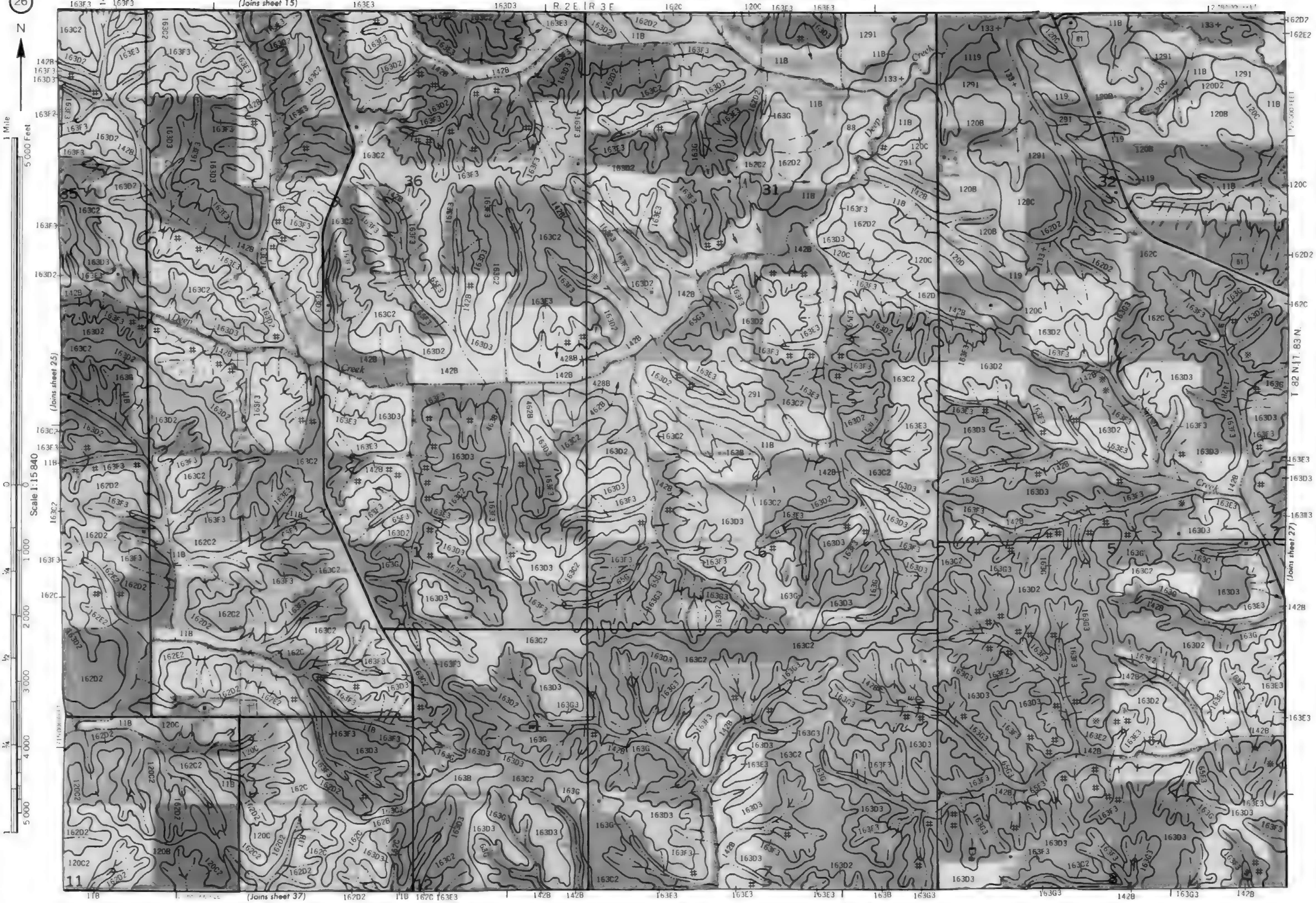

22
N
(Joins sheet 11)
R 6 E | R 7 E
(Joins sheet 21)
(Joins sheet 33)
T. 83 N.
LIMIT OF SOIL SURVEY
ELK RIVER
MISSISSIPPI RIVER
CARROLL COUNTY ILLINOIS
INDEFINITE BOUNDARY
CHICAGO MILWAUKEE ST. PAUL + PACIFIC
water
Scale 1:15 840
1 Mile
5 000 Feet
0
¼
½
¾
1 000
2 000
3 000
4 000
5 000


23
N
(Joins sheet 12)
(Joins sheet 24)
(Joins sheet 34)
R 1 E
T 82 N | T. 83 N.
CEDAR COUNTY
JONES COUNTY
1 Mile
5 000 Feet
Scale 1:15 840
CHICAGO MILWAUKEE ST. PAUL AND PACIFIC
Ditch
water
31
32
33
34
6
5
4
3
7
8
9
10

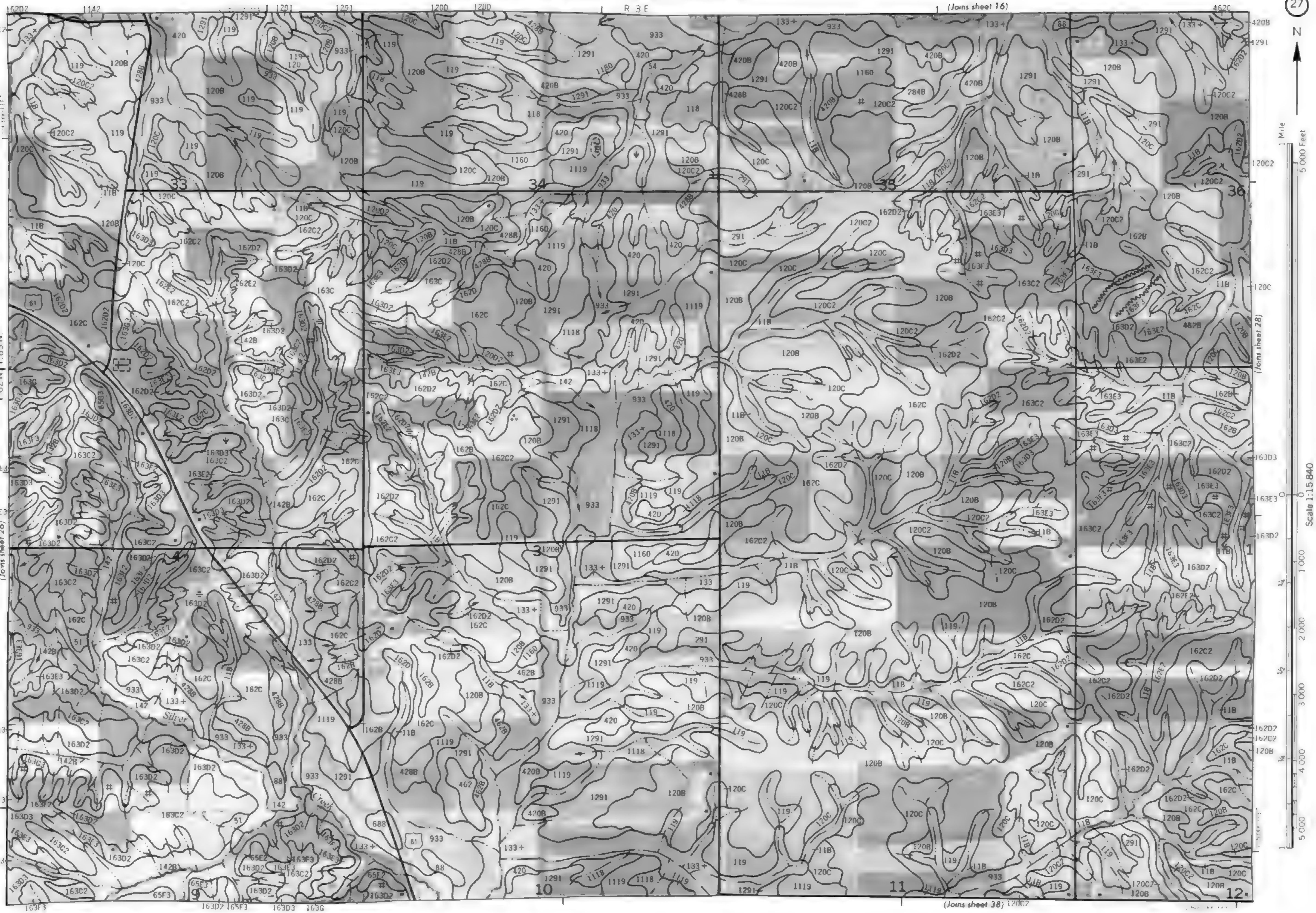

N
(Joins sheet 13)
(Joins sheet 23)
(Joins sheet 25)
(Joins sheet 35)
R. 1 E. R. 2 E.
T. 82 N. T. 83 N.
Scale 1:15 840
1 Mile
5 000 Feet
SEWAGE LAGOON
Drainage Ditch
water
34
35
36
31
3
2
1
6
10
11
12
7

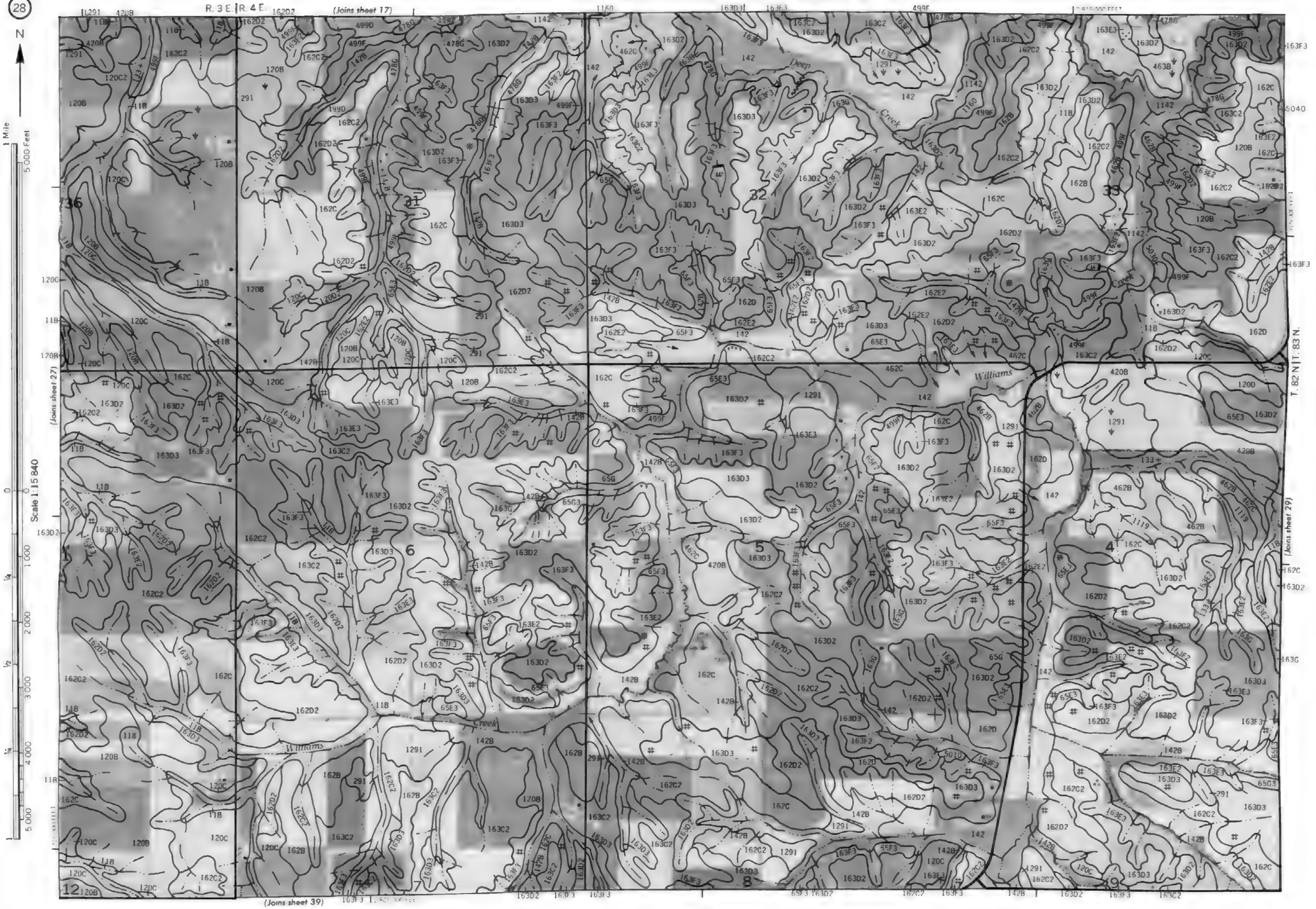
CLINTON COUNTY, IOWA — SHEET NUMBER 25

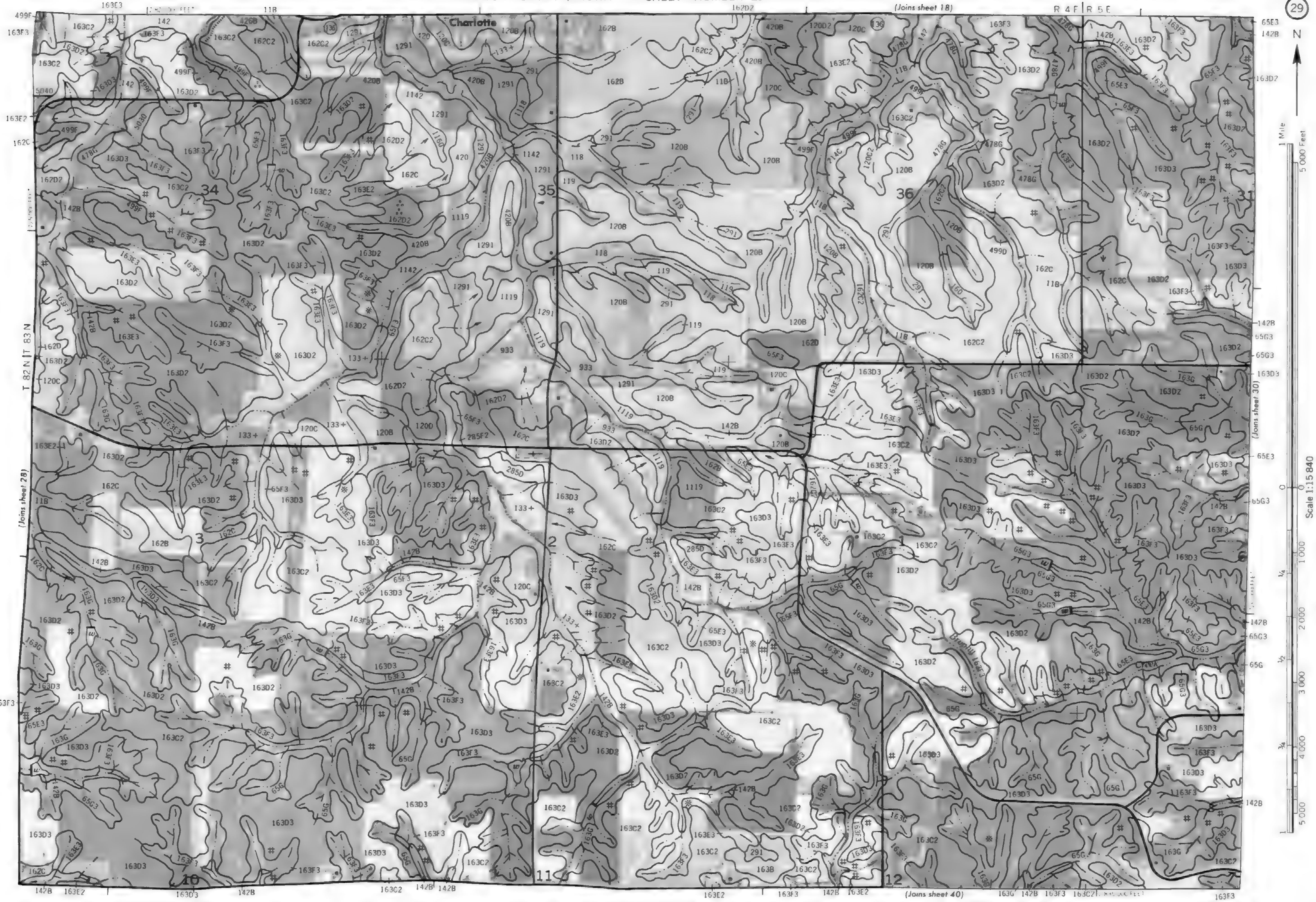


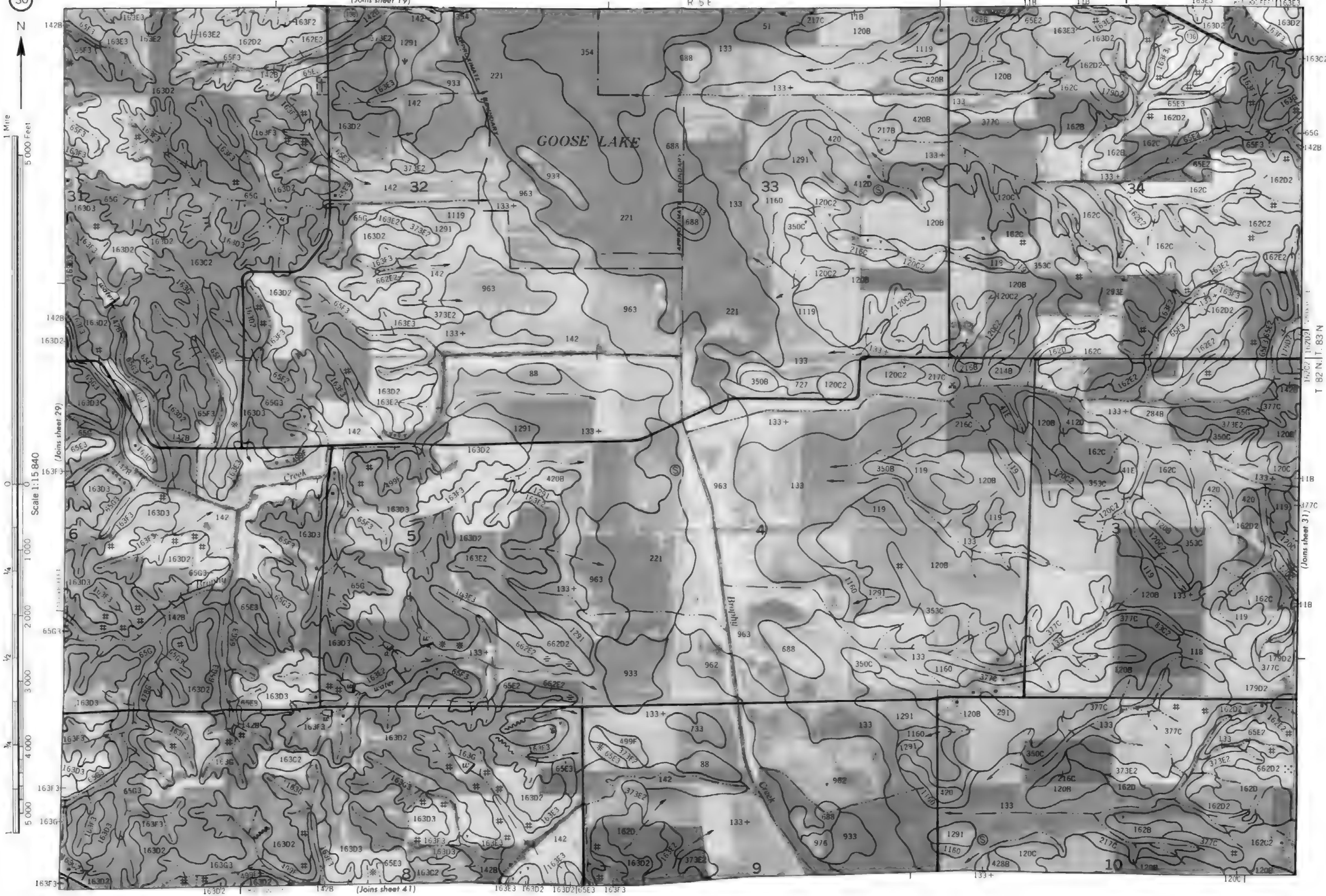

(Joins sheet 15)
(Joins sheet 25)
(Joins sheet 27)
(Joins sheet 37)
N
1 Mile
5 000 Feet
Scale 1:15 840
R. 2 E. | R. 3 E.
T. 82 N. | T. 83 N.

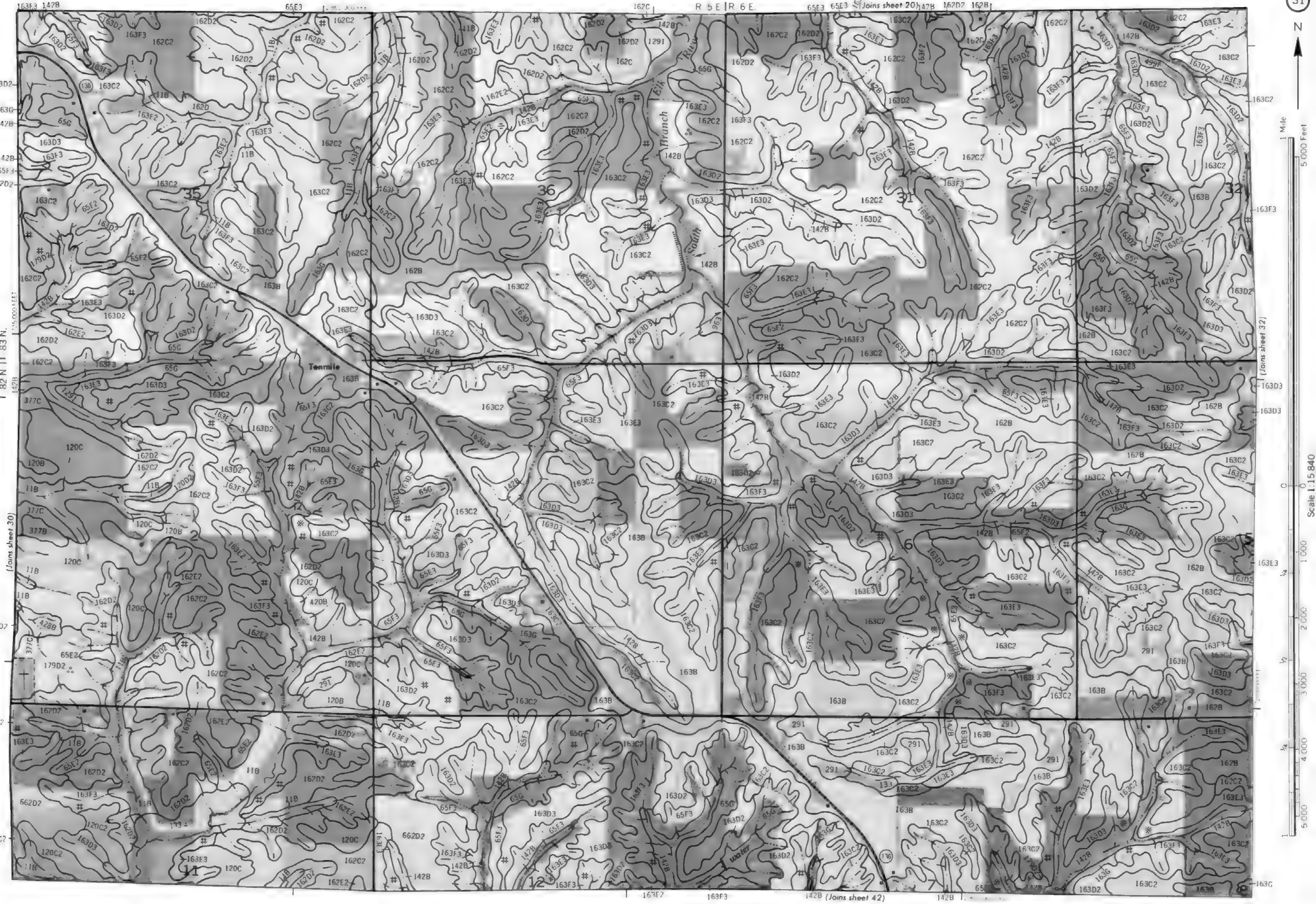
CLINTON COUNTY, IOWA — SHEET NUMBER 27




28
N
(Joins sheet 17)
(Joins sheet 27)
(Joins sheet 29)
(Joins sheet 39)
R. 3 E. | R. 4 E.
T. 82 N. | T. 83 N.
Deep Creek
Williams Creek
Scale 1:15 840
1 Mile
5 000 Feet
31
32
33
36
4
5
6
8
9
12

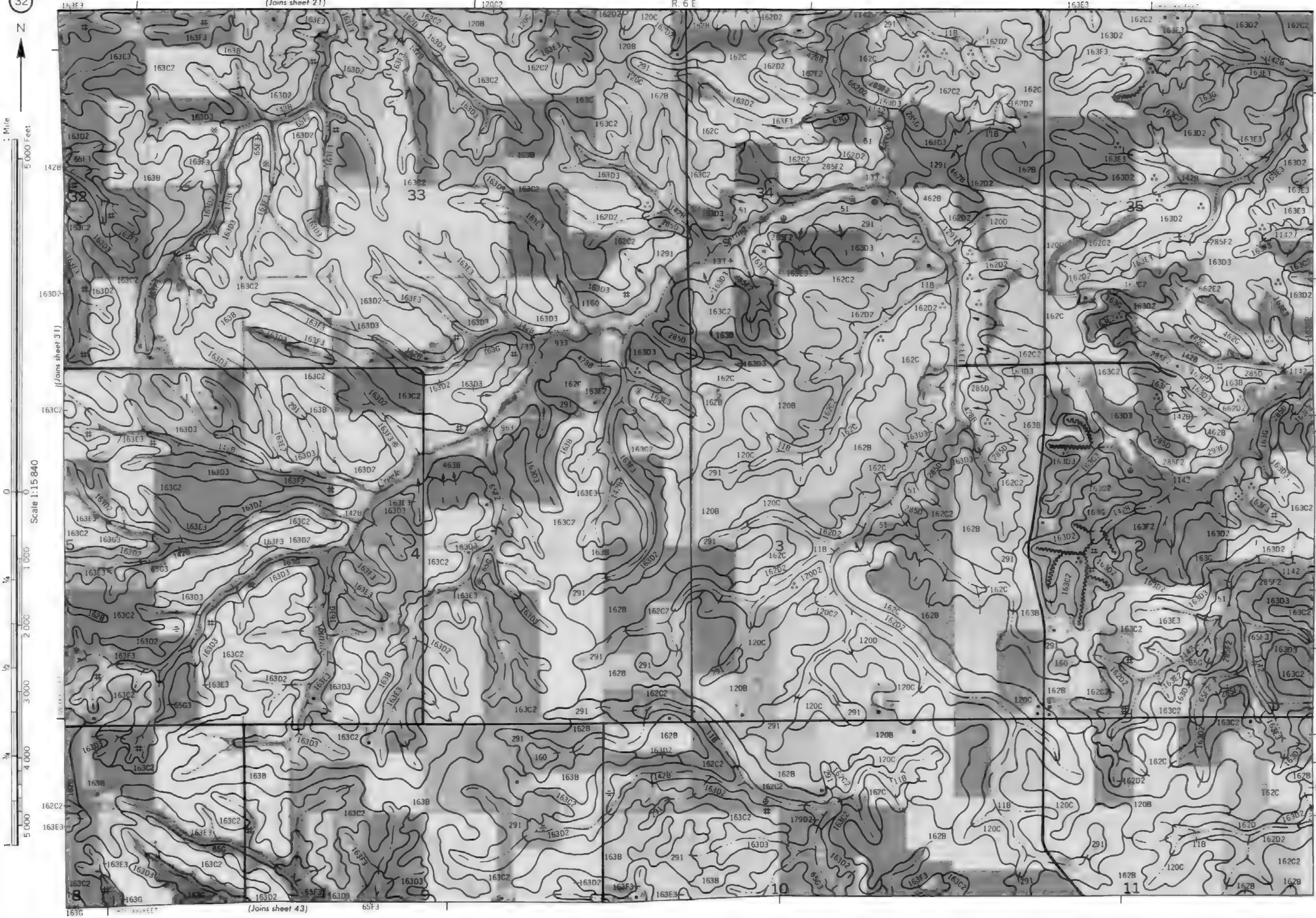

29
N
Charlotte
(Joins sheet 18)
(Joins sheet 28)
(Joins sheet 30)
(Joins sheet 40)
R 4 E | R 5 E
T 82 N | T 83 N
34
35
36
31
3
2
1
6
10
11
12
7
1 Mile
5 000 Feet
Scale 1:15 840
0
1000
2000
3000
4000
5 000


N
1 Mile
5 000 Feet
Scale 1:15 840
(Joins sheet 19)
(Joins sheet 29)
(Joins sheet 31)
(Joins sheet 41)
R 5 E
T 83 N
T 82 N
GOOSE LAKE
APPROXIMATE BOUNDARY
Brophy
Creek
31
32
33
34
6
5
4
3
8
9
10

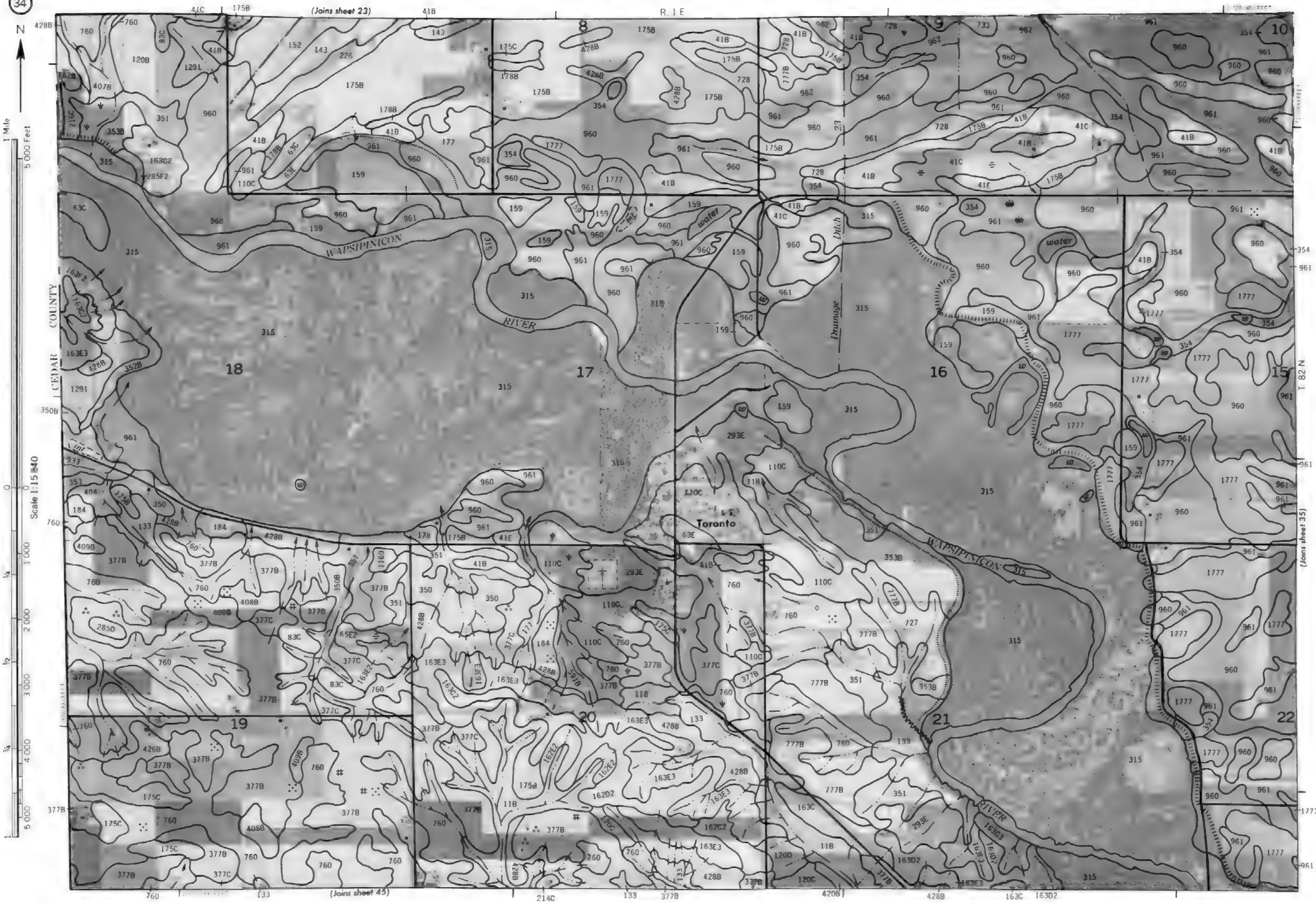


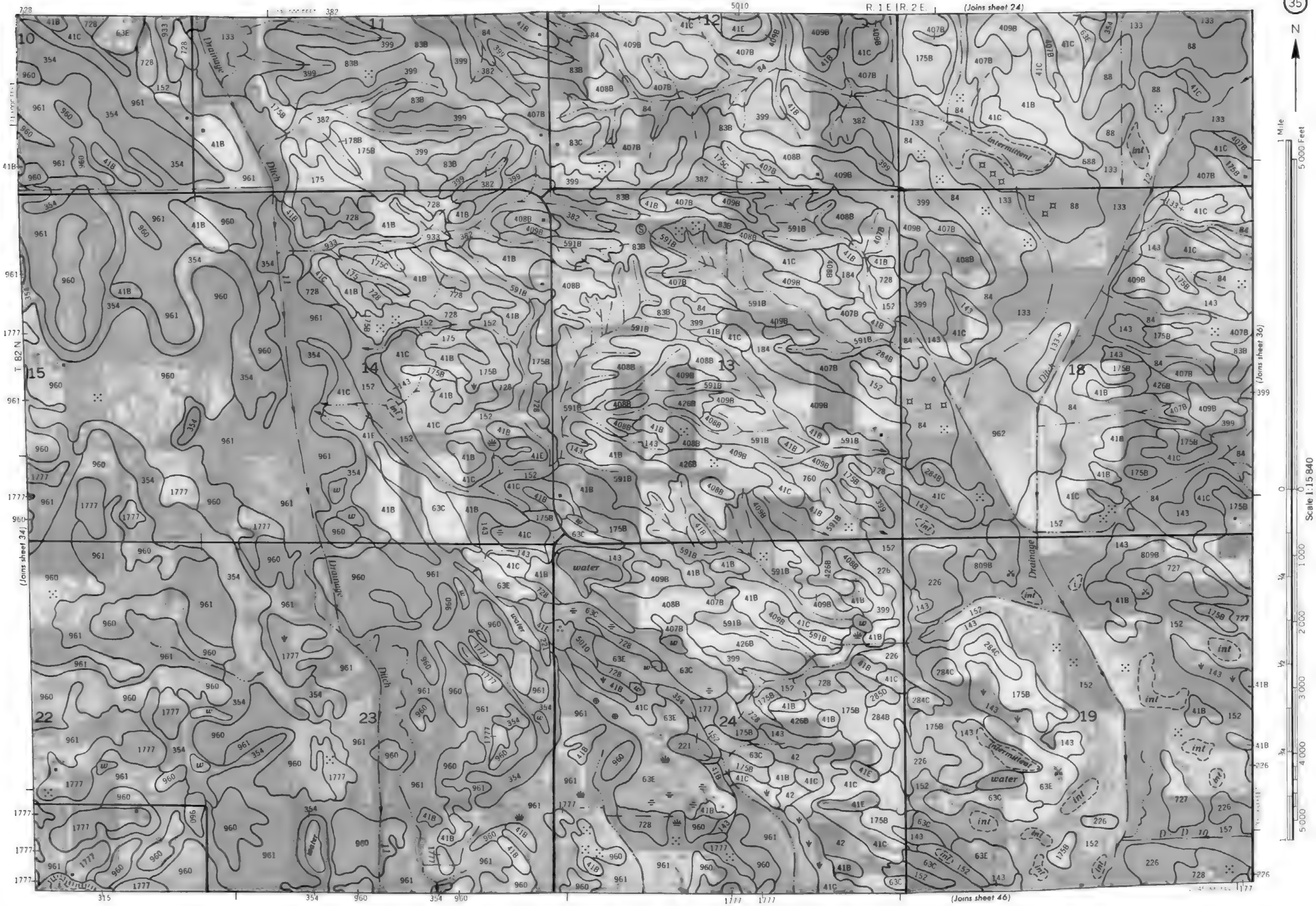
(Joins sheet 20)
(Joins sheet 32)
(Joins sheet 42)
(Joins sheet 30)
R 5 E | R 6 E
T 82 N | T 83 N
N
Tenmile
Elk River
South Branch
water
35
36
31
32
2
1
6
5
11
12
Scale 1:15 840
1 Mile
5 000 Feet

CLINTON COUNTY, IOWA — SHEET NUMBER 32

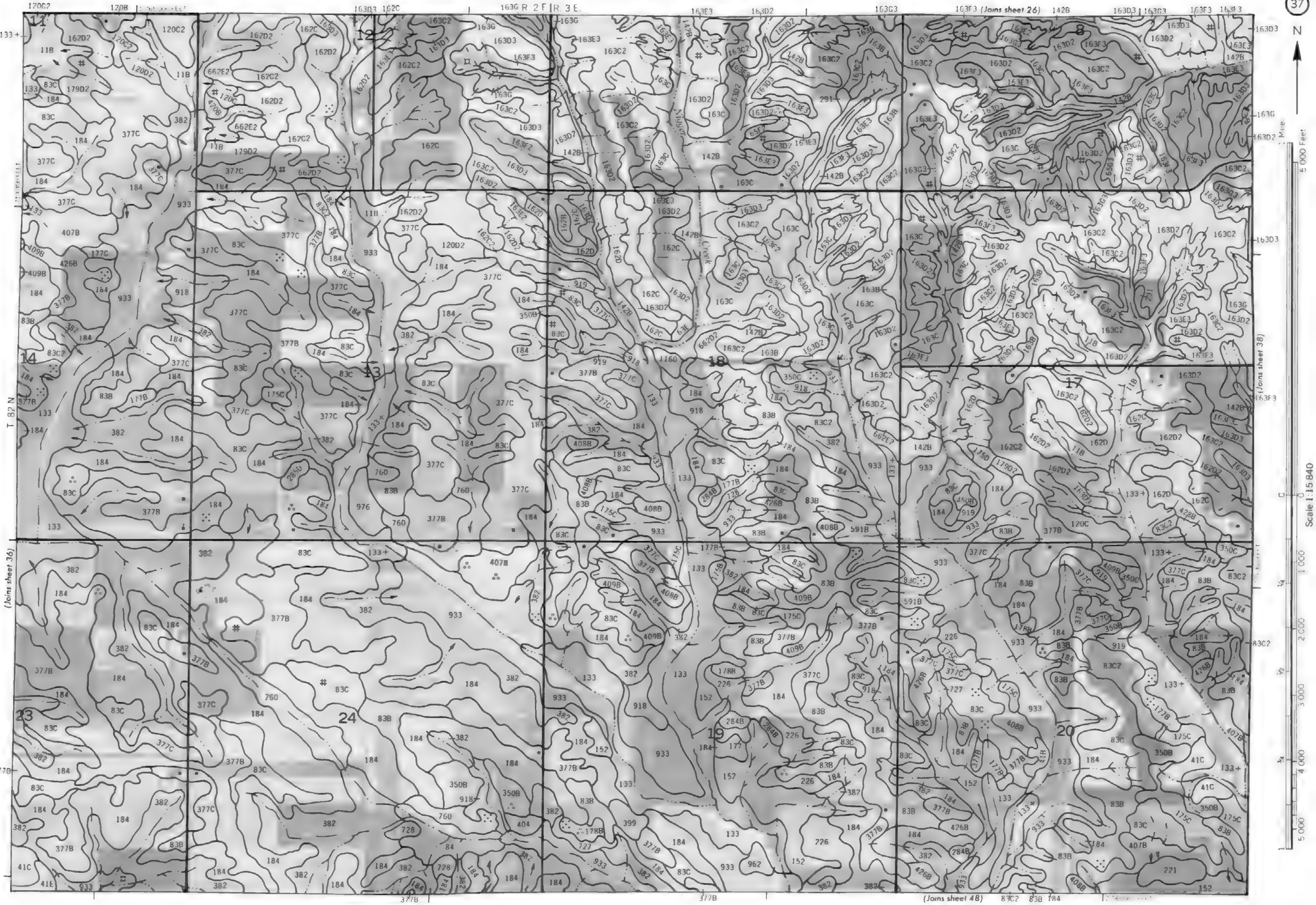


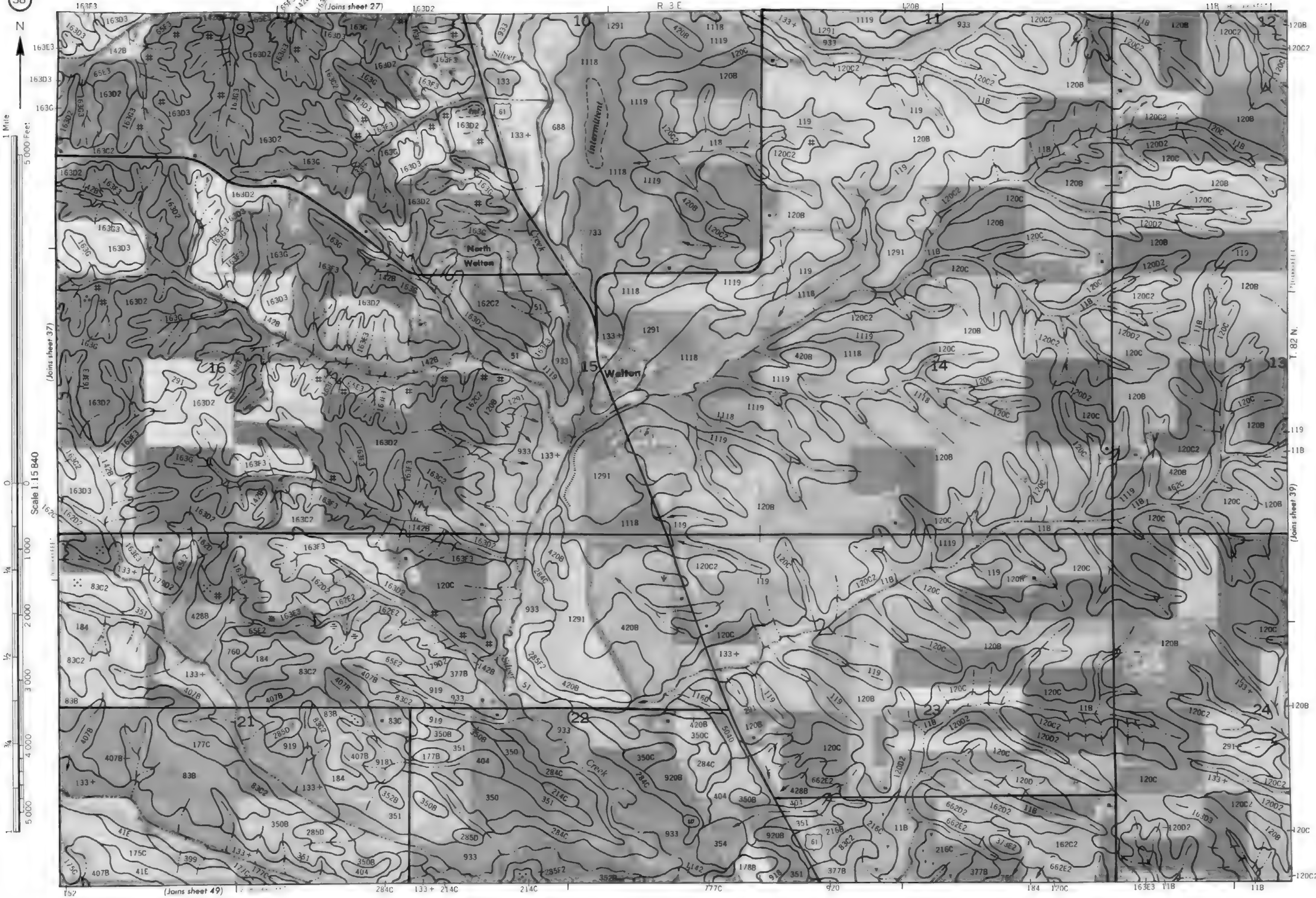

33
R 6 E | R 7 E
(Joins sheet 22)
(Joins sheet 32)
(Joins sheet 44)
T. 82 N | T. 83 N
MISSISSIPPI
RIVER
ILLINOIS
INDEFINITE BOUNDARY
CHICAGO
MILWAUKEE
ST PAUL
AND
PACIFIC
CARROLL COUNTY
WHITESIDE COUNTY
N
1 Mile
5 000 Feet
Scale 1:15 840

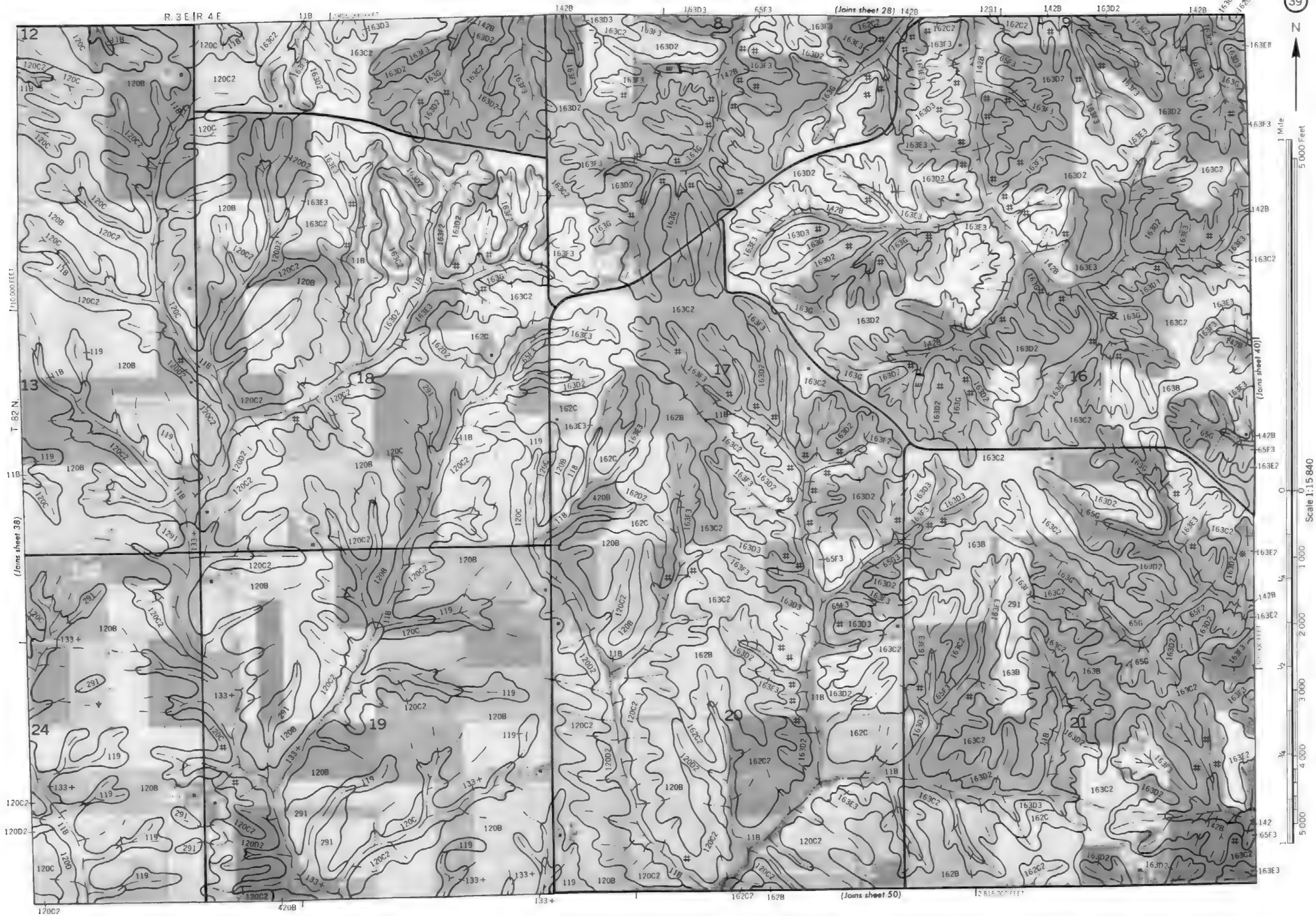

(Joins sheet 23)
R. 1 E.
T. 82 N.
(Joins sheet 35)
(Joins sheet 45)
N
1 Mile
5 000 Feet
Scale 1:15 840
CEDAR COUNTY
WAPSIPINICON RIVER
WAPSIPINICON RIVER
Drainage Ditch
Toronto
water
7
8
9
10
15
16
17
18
19
20
21
22


(Joins sheet 24)
R. 1 E. | R. 2 E.
(Joins sheet 36)
(Joins sheet 46)
(Joins sheet 34)
T. 82 N.
N
1 Mile
5 000 Feet
Scale 1:15 840
Ditch
Drainage Ditch
Intermittent
water
10
11
12
13
14
15
18
19
22
23
24

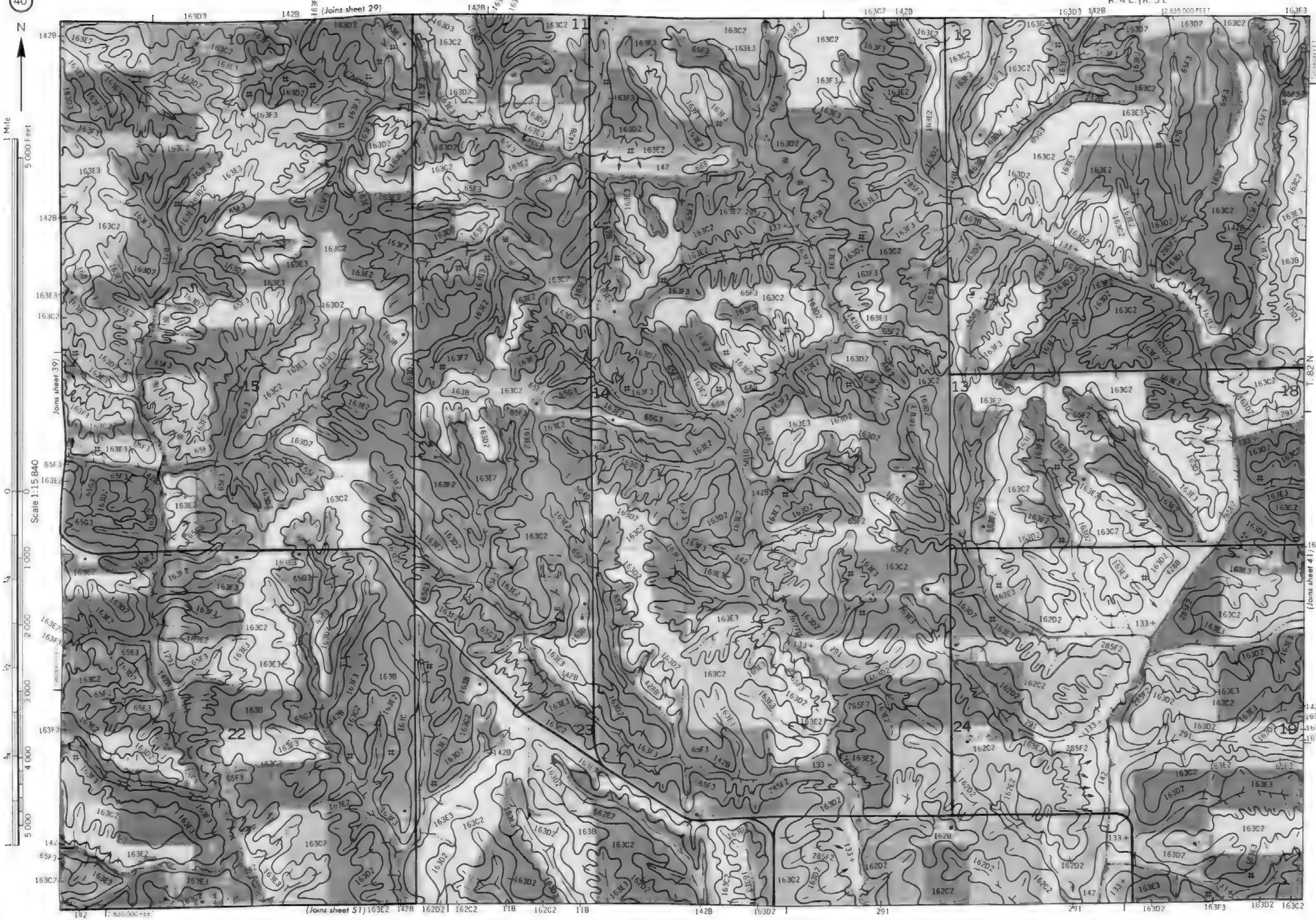

(Joins sheet 25)
R. 2 E.
(Joins sheet 35)
(Joins sheet 37)
T. 82 N.
(Joins sheet 47)
N
1 Mile
5 000 Feet
Scale 1:15 840
Ditch
Drainage

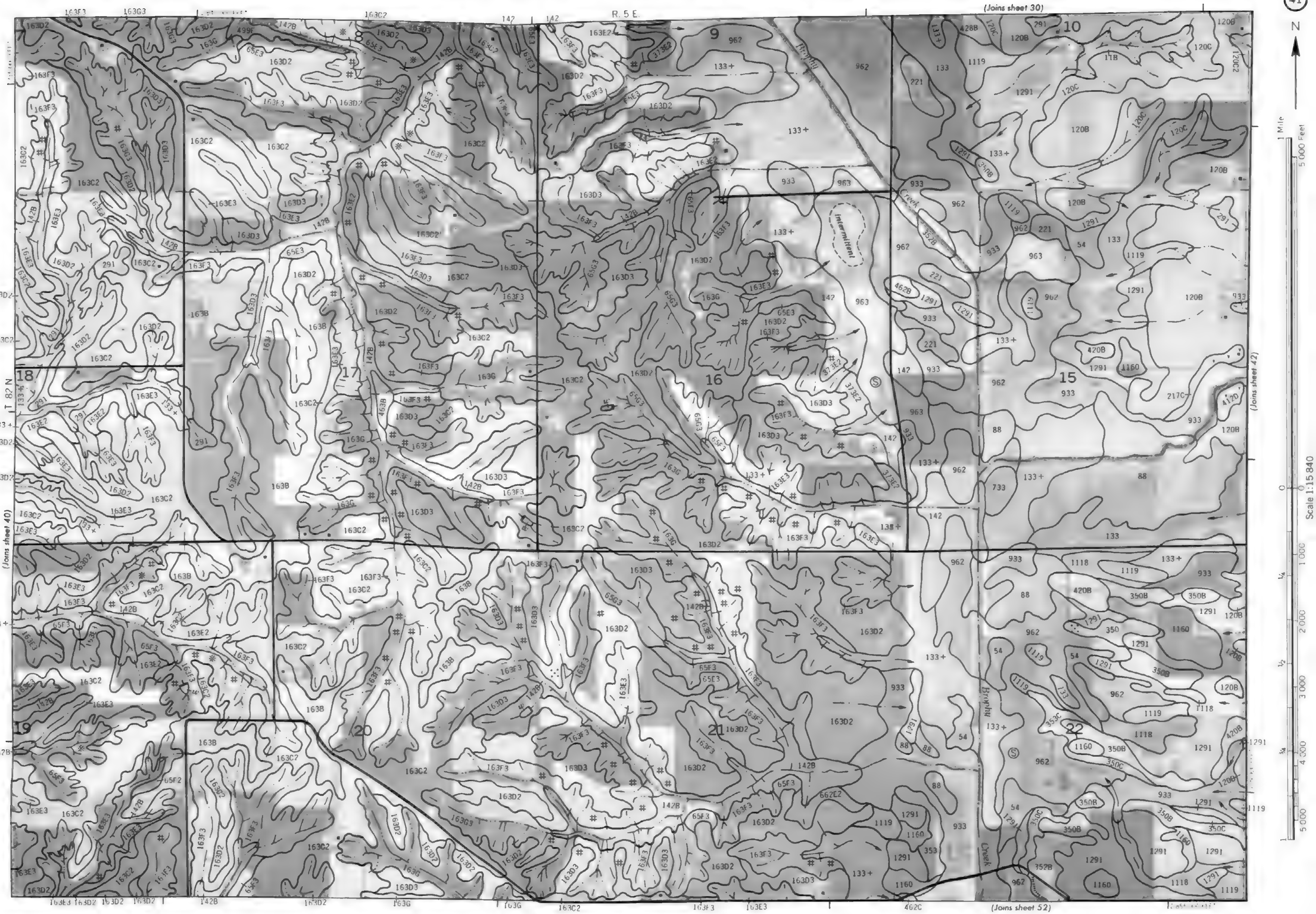

R. 2 E. | R. 3 E.
(Joins sheet 26)
(Joins sheet 36)
(Joins sheet 38)
(Joins sheet 48)
T 82 N
N
Scale 1:15 840
5 000 Feet
1 Mile
7
8
11
12
13
14
17
18
19
20
23
24


(Joins sheet 27)
(Joins sheet 37)
(Joins sheet 39)
(Joins sheet 49)
R 3 E
T. 82 N.
N
1 Mile
5 000 Feet
Scale 1:15 840
North Welton
Welton
Silver
Creek
Intermittent

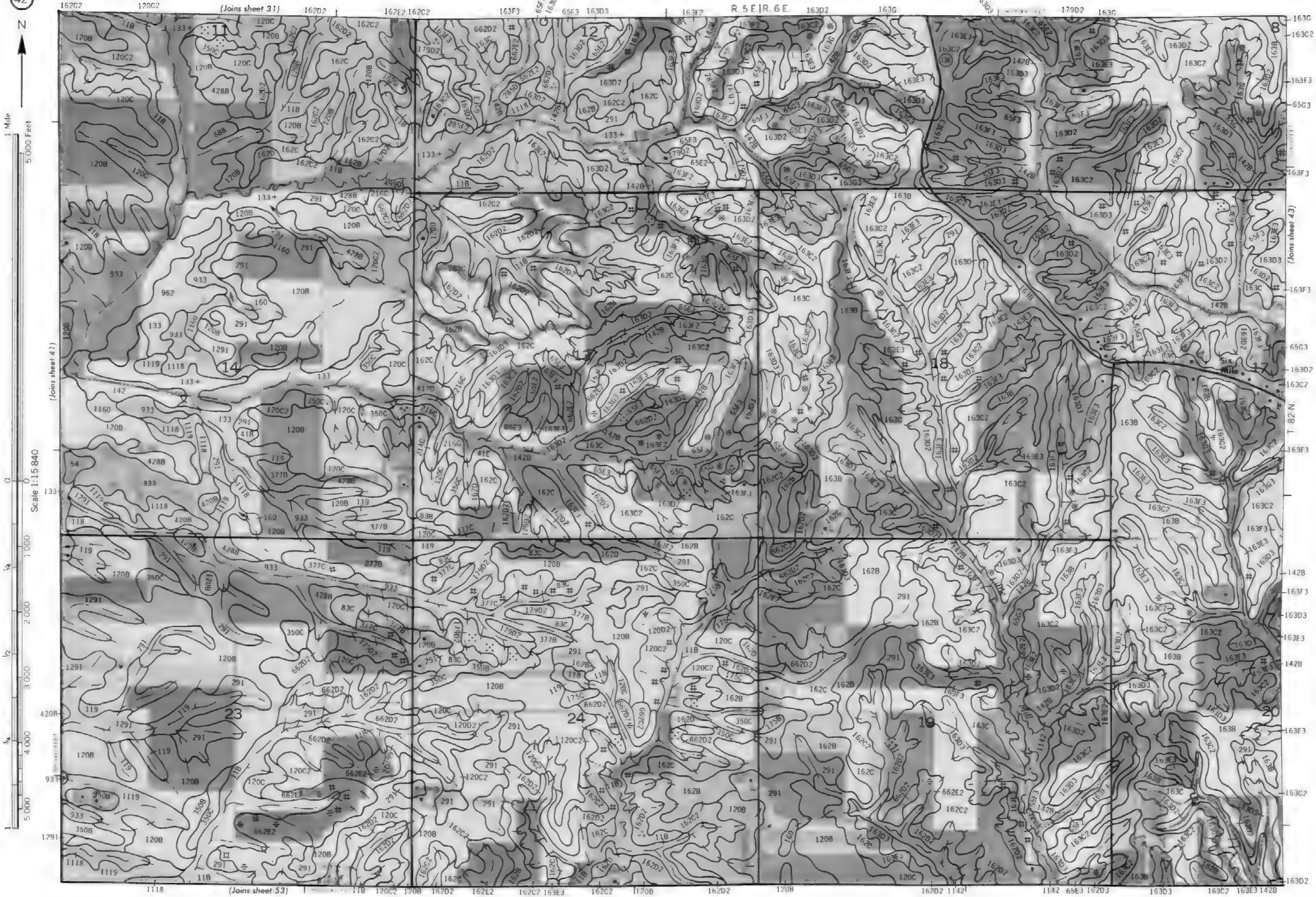

R. 3 E | R. 4 E
T. 82 N.
(Joins sheet 28)
(Joins sheet 38)
(Joins sheet 40)
(Joins sheet 50)
N
1 Mile
5 000 Feet
Scale 1:15 840
12
7
8
9
13
18
17
16
24
19
20
21

CLINTON COUNTY, IOWA — SHEET NUMBER 40

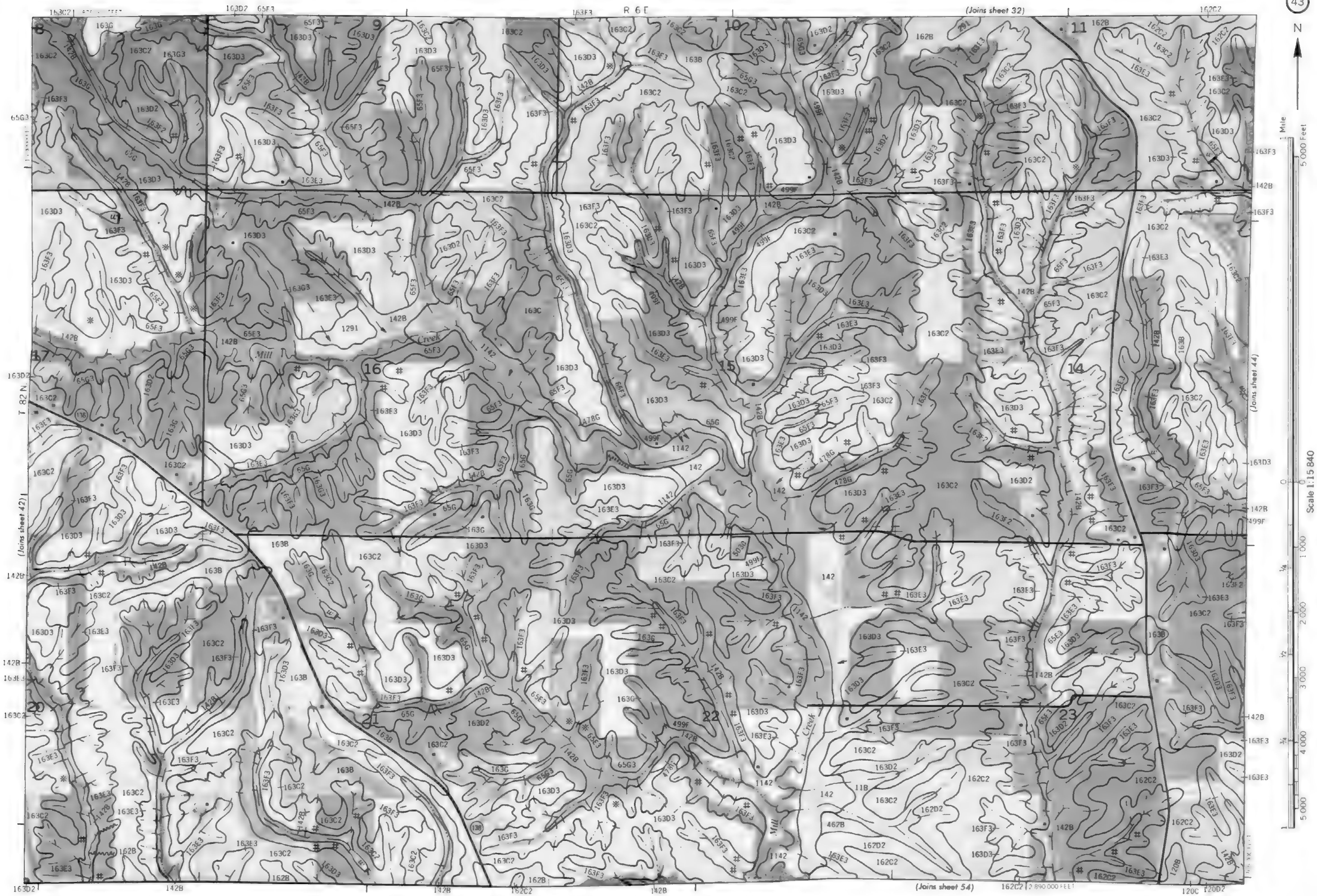



(Joins sheet 30)
R. 5 E.
T. 82 N.
(Joins sheet 40)
(Joins sheet 42)
(Joins sheet 52)
Brophy Creek
Intermittent
N
1 Mile
5 000 Feet
Scale 1:15 840

CLINTON COUNTY, IOWA — SHEET NUMBER 42

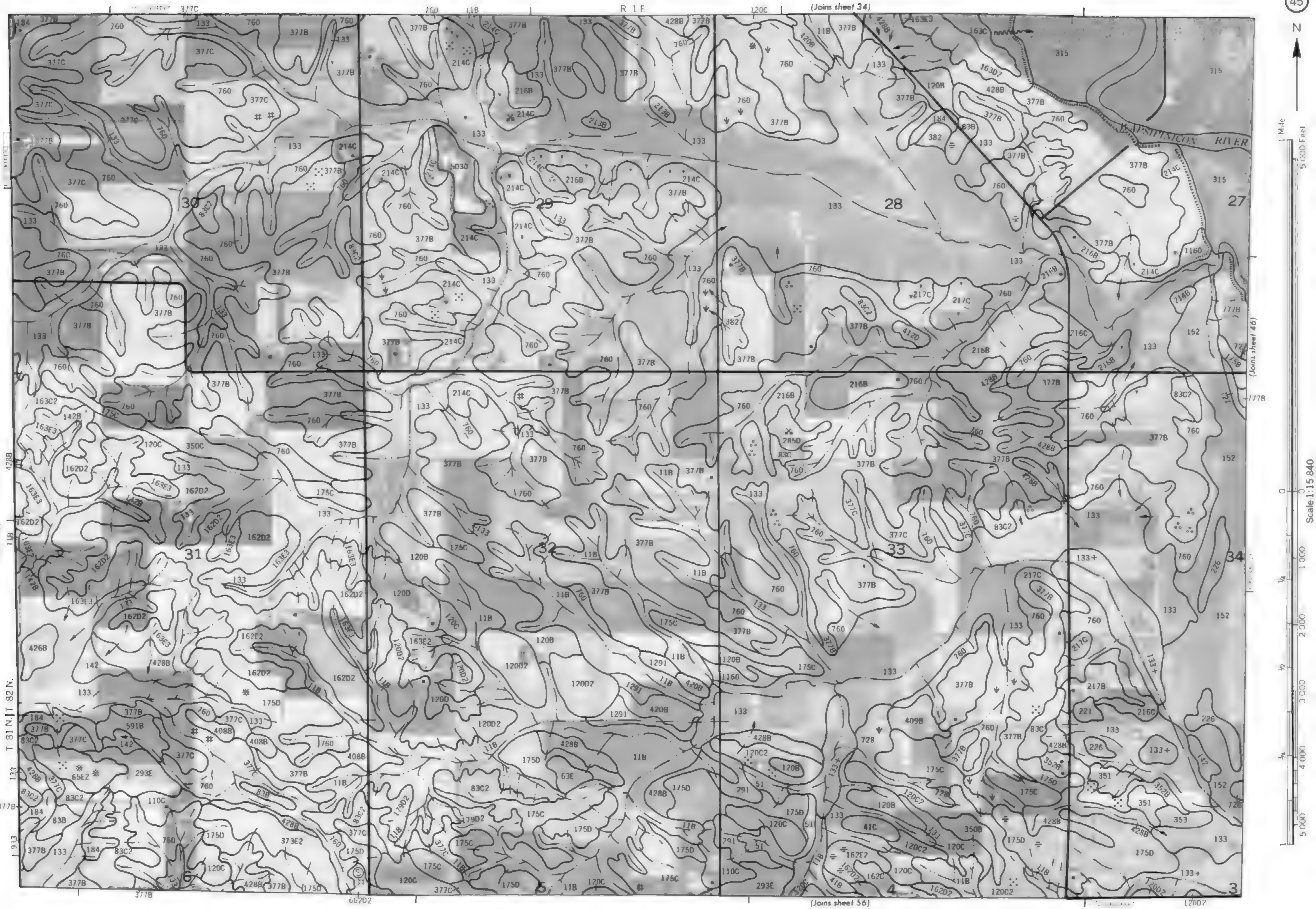


CLINTON COUNTY, IOWA — SHEET NUMBER 43



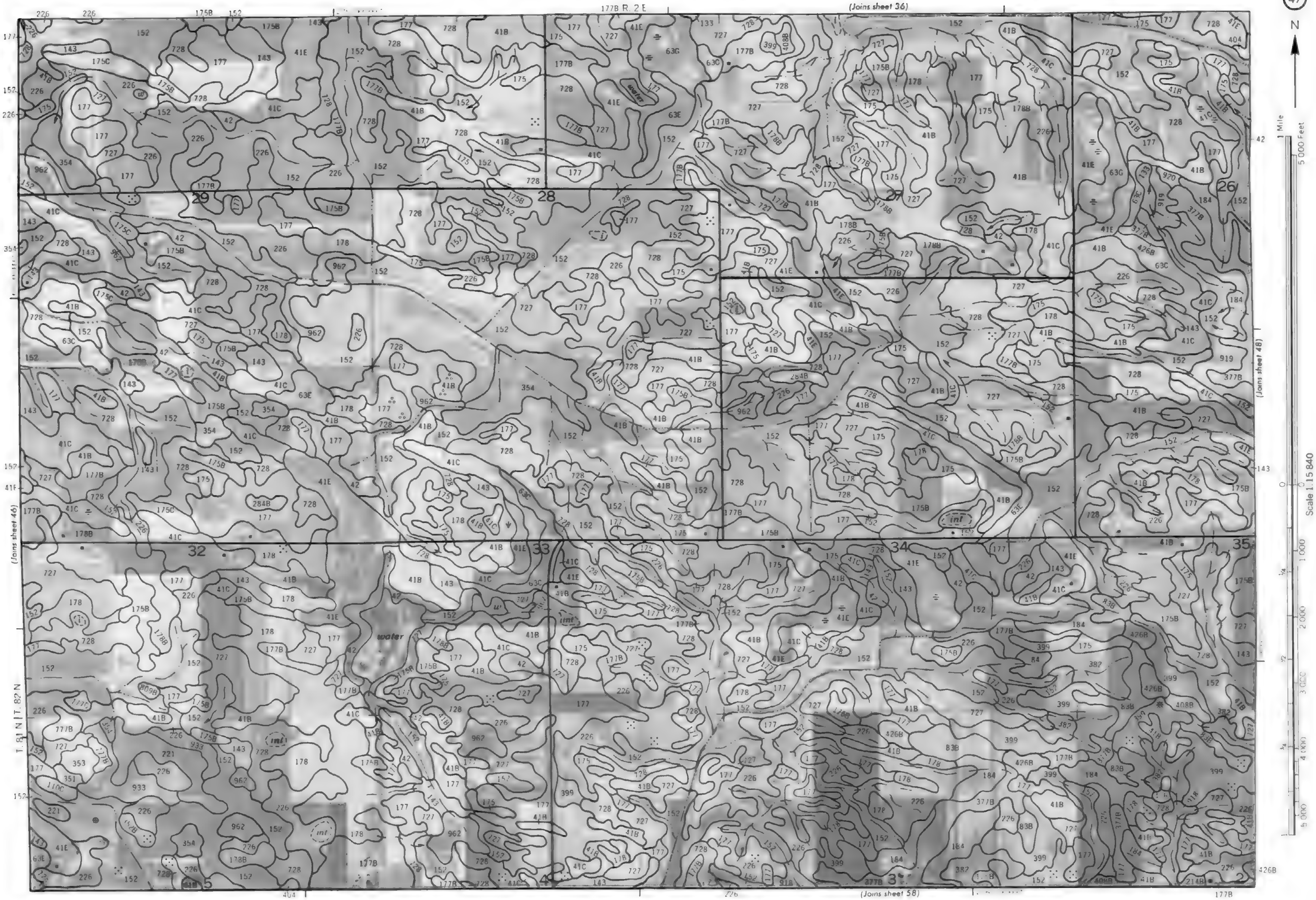

44
N
(Joins sheet 33)
(Joins sheet 43)
(Joins sheet 55)
R. 6 E. | R. 7 E.
T. 82 N.
Scale 1:15 840
1 Mile
5 000 Feet
MISSISSIPPI
RIVER
LYONS CHUTE
STAMPS ISLAND
water
WHITESIDE COUNTY
ILLINOIS
INDEFINITE BOUNDARY
CHICAGO MILWAUKEE ST. PAUL AND PACIFIC

CLINTON COUNTY, IOWA — SHEET NUMBER 45



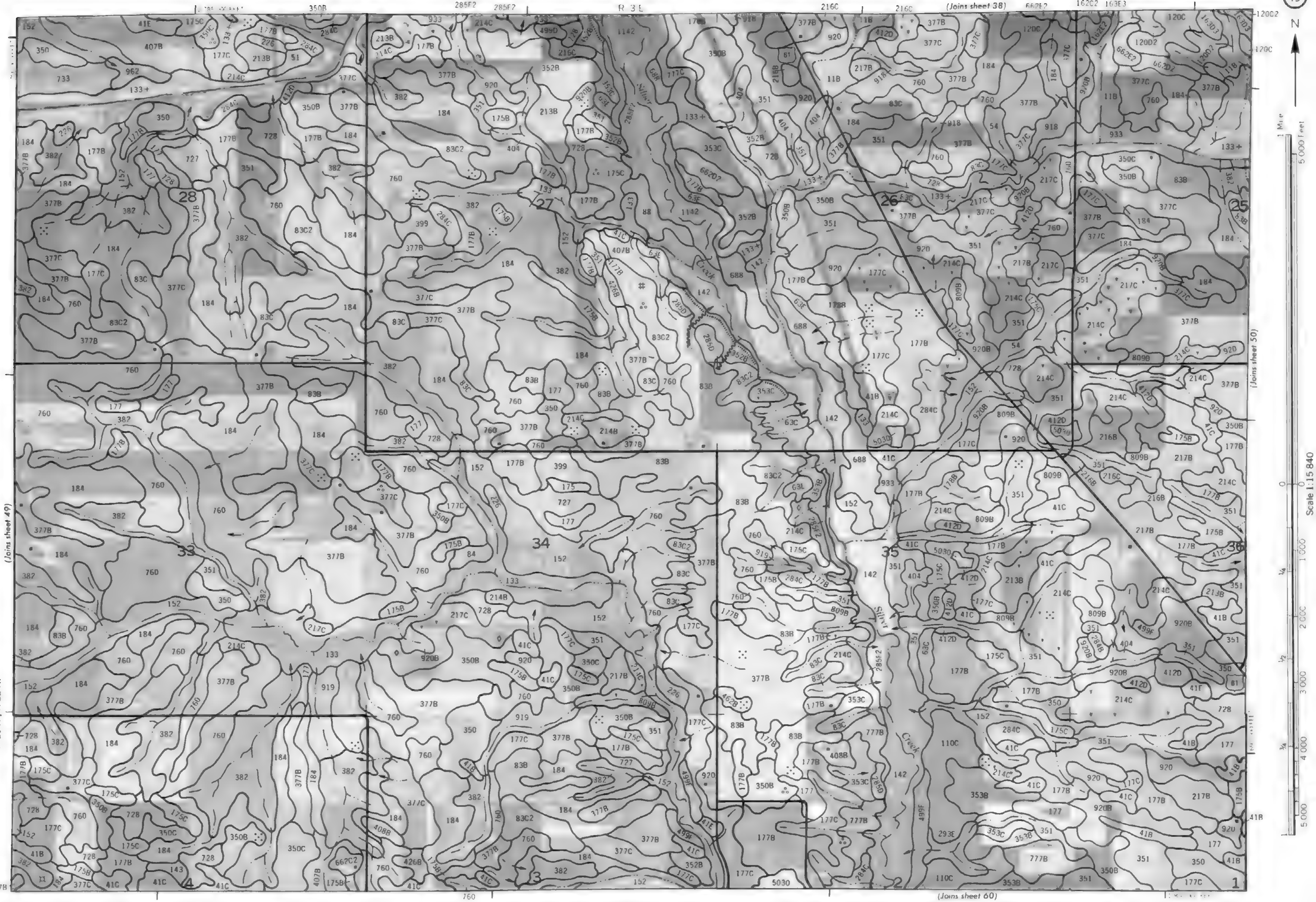

(Joins sheet 35)
(Joins sheet 45)
(Joins sheet 47)
(Joins sheet 57)
R. 1 E. R. 2 E.
T. 81 N. T. 82 N.
N
1 Mile
5 000 Feet
Scale 1:15 840
WAPSIPINICON
RIVER
MOCKRIDGE
WILDLIFE
PRESERVE
Intermittent
Drainage
Ditch
27
26
25
30
34
35
36
31
3
2
1
6

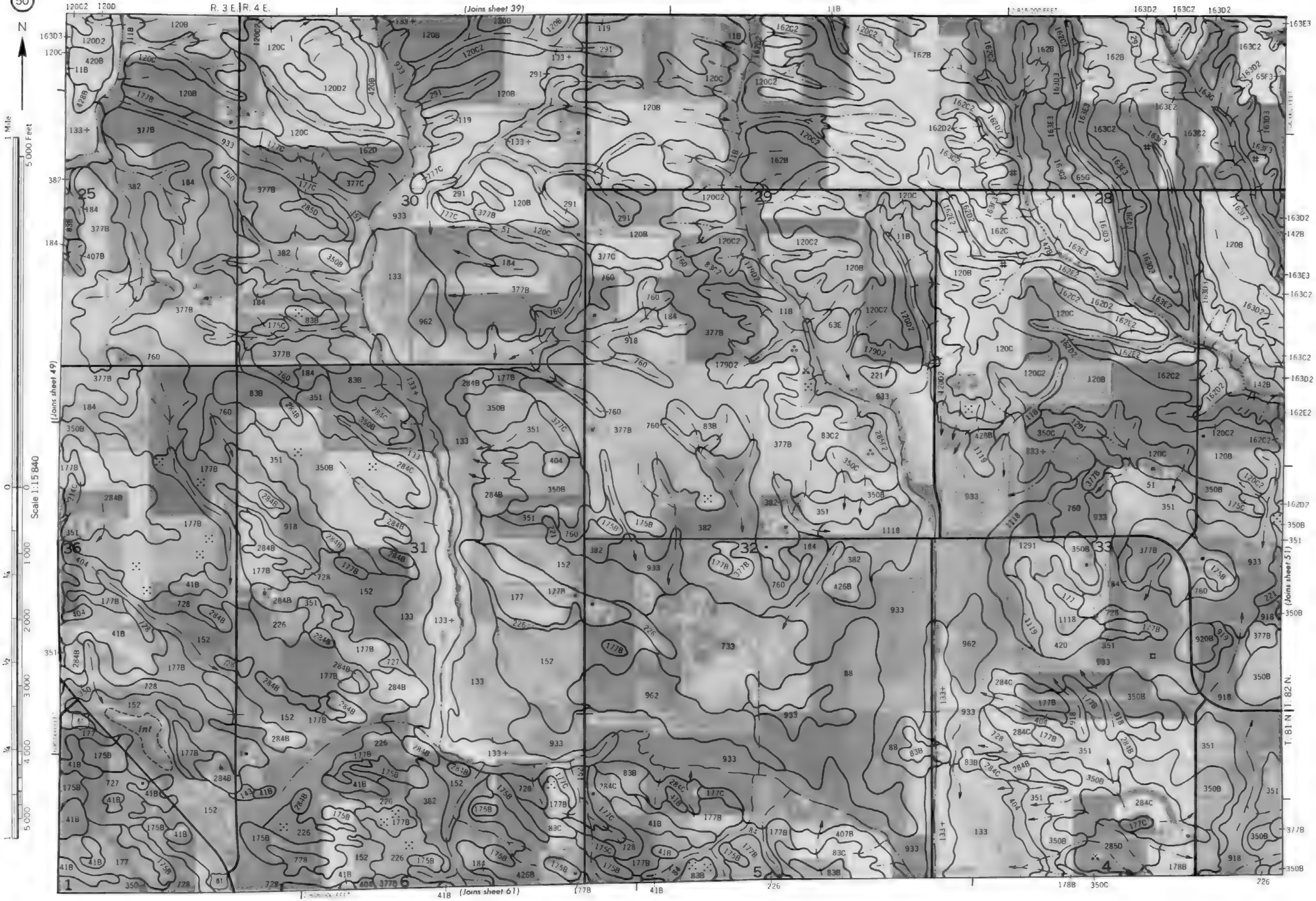
CLINTON COUNTY, IOWA — SHEET NUMBER 47

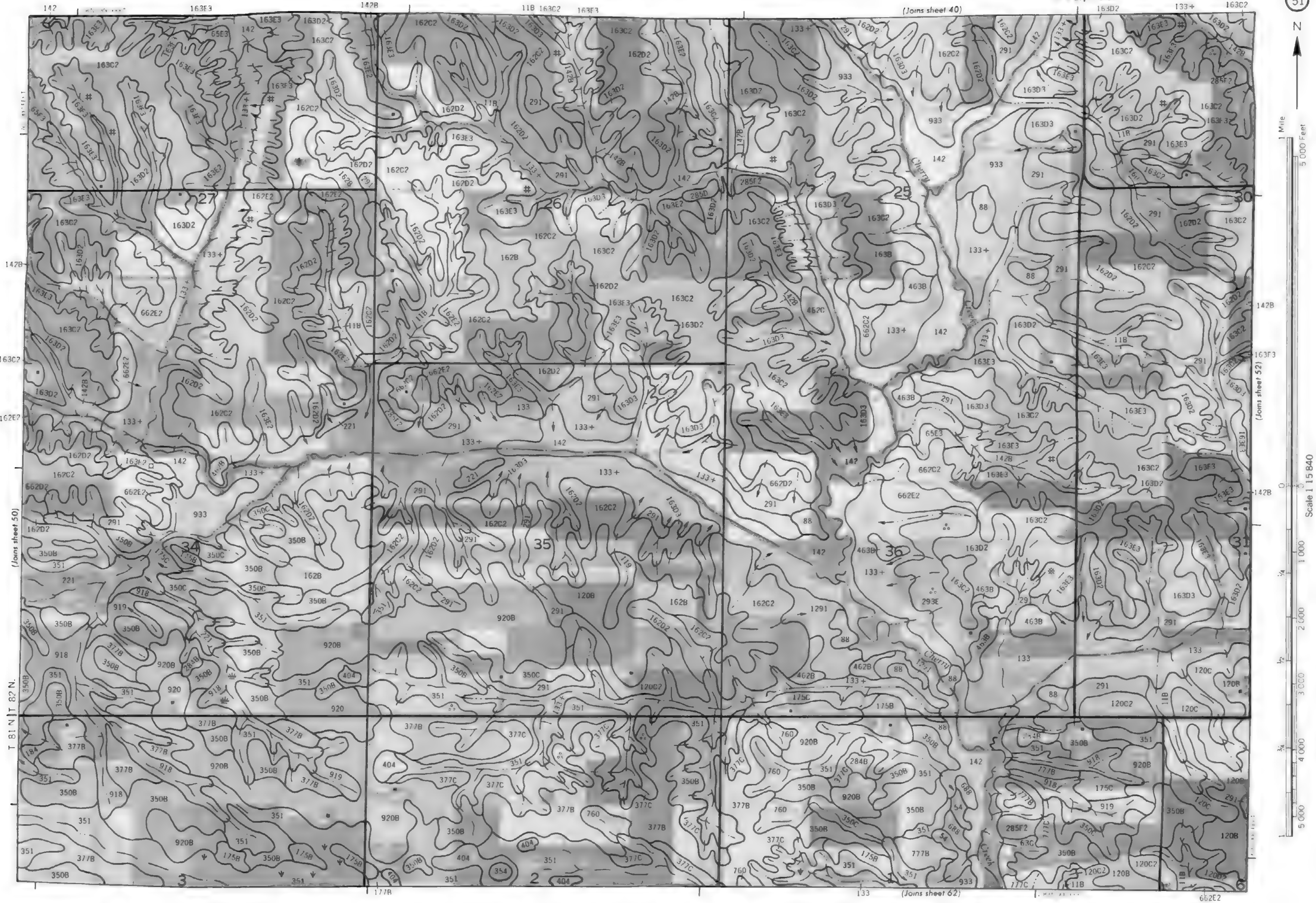


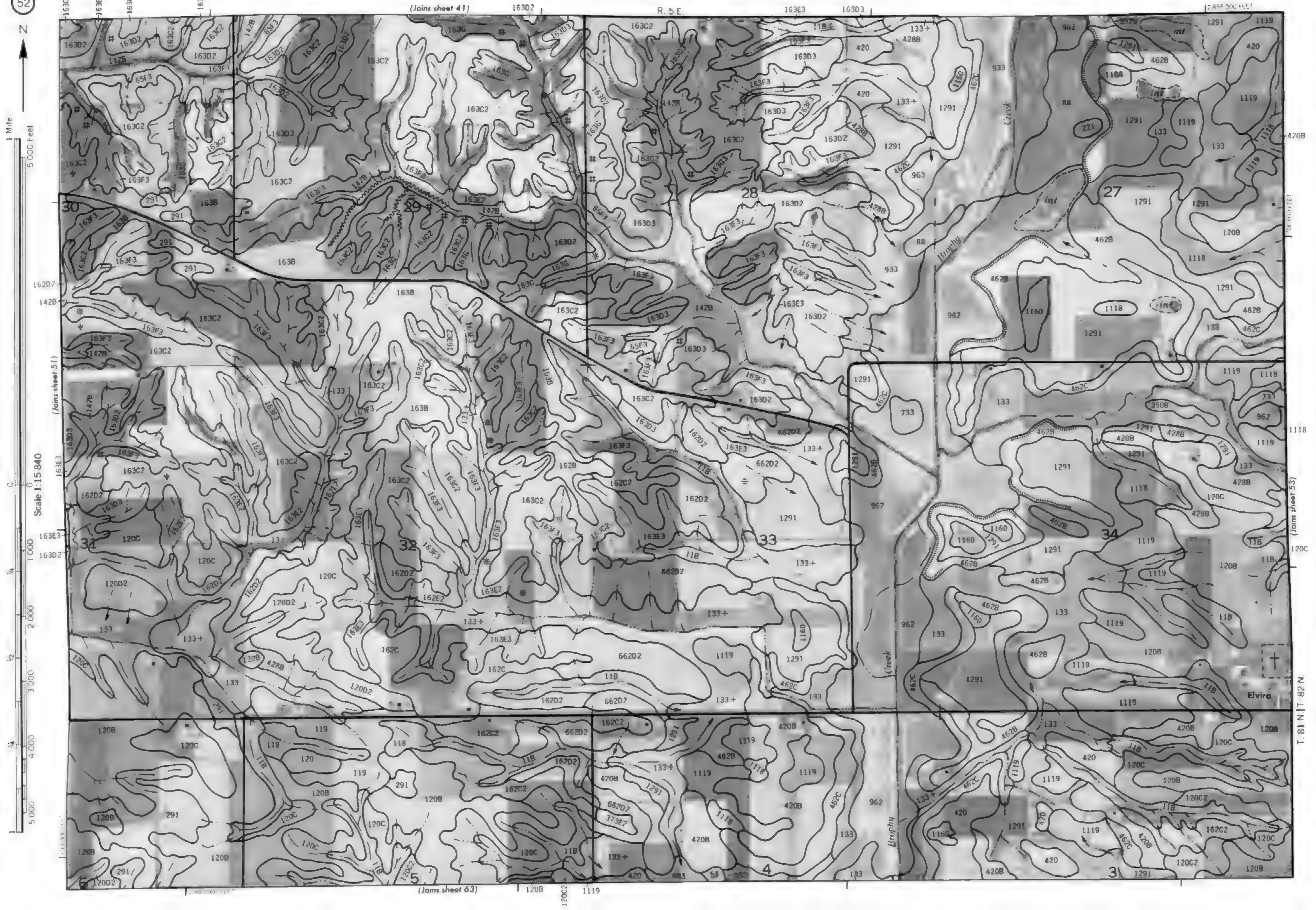
48

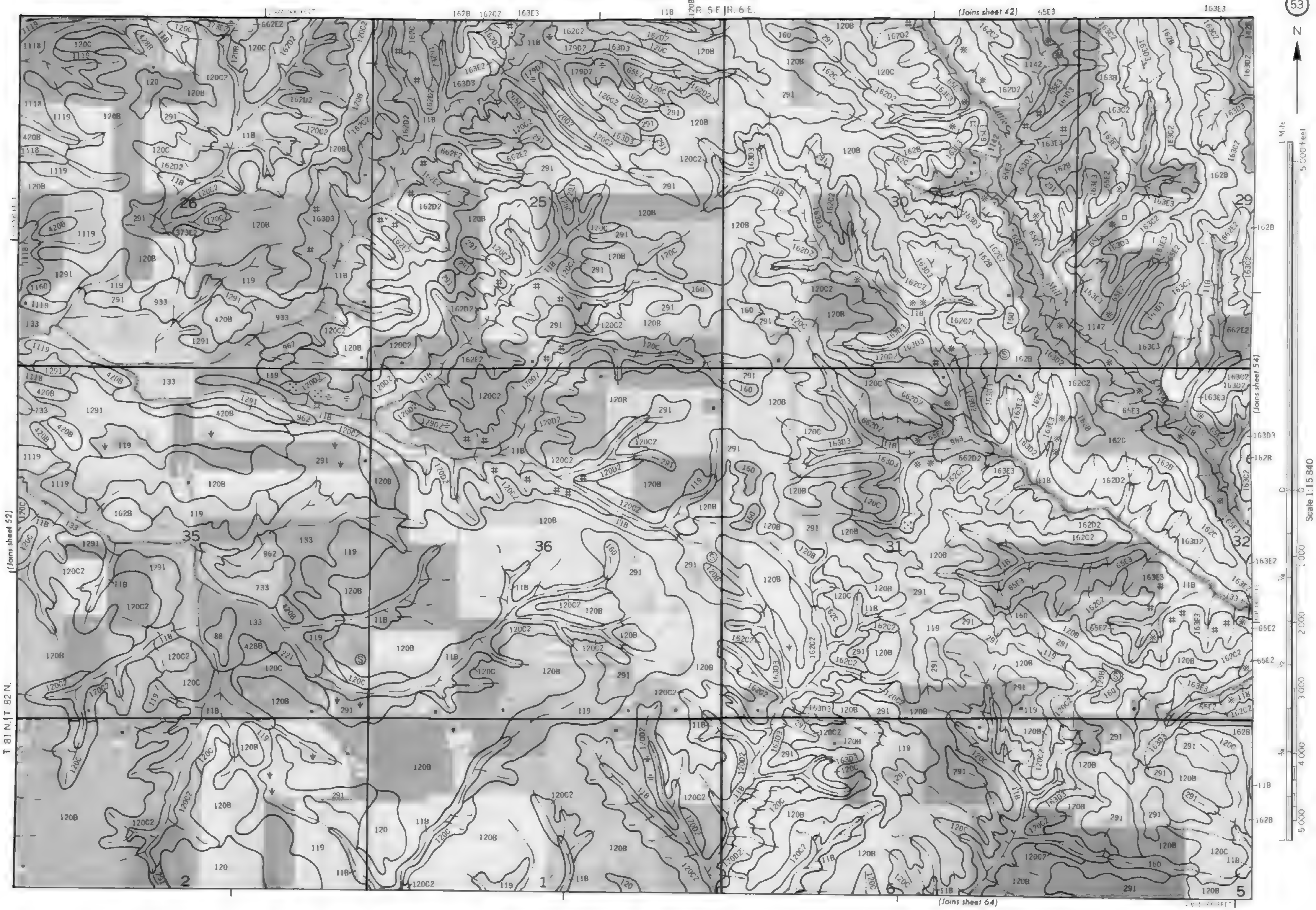
CLINTON COUNTY, IOWA — SHEET NUMBER 48

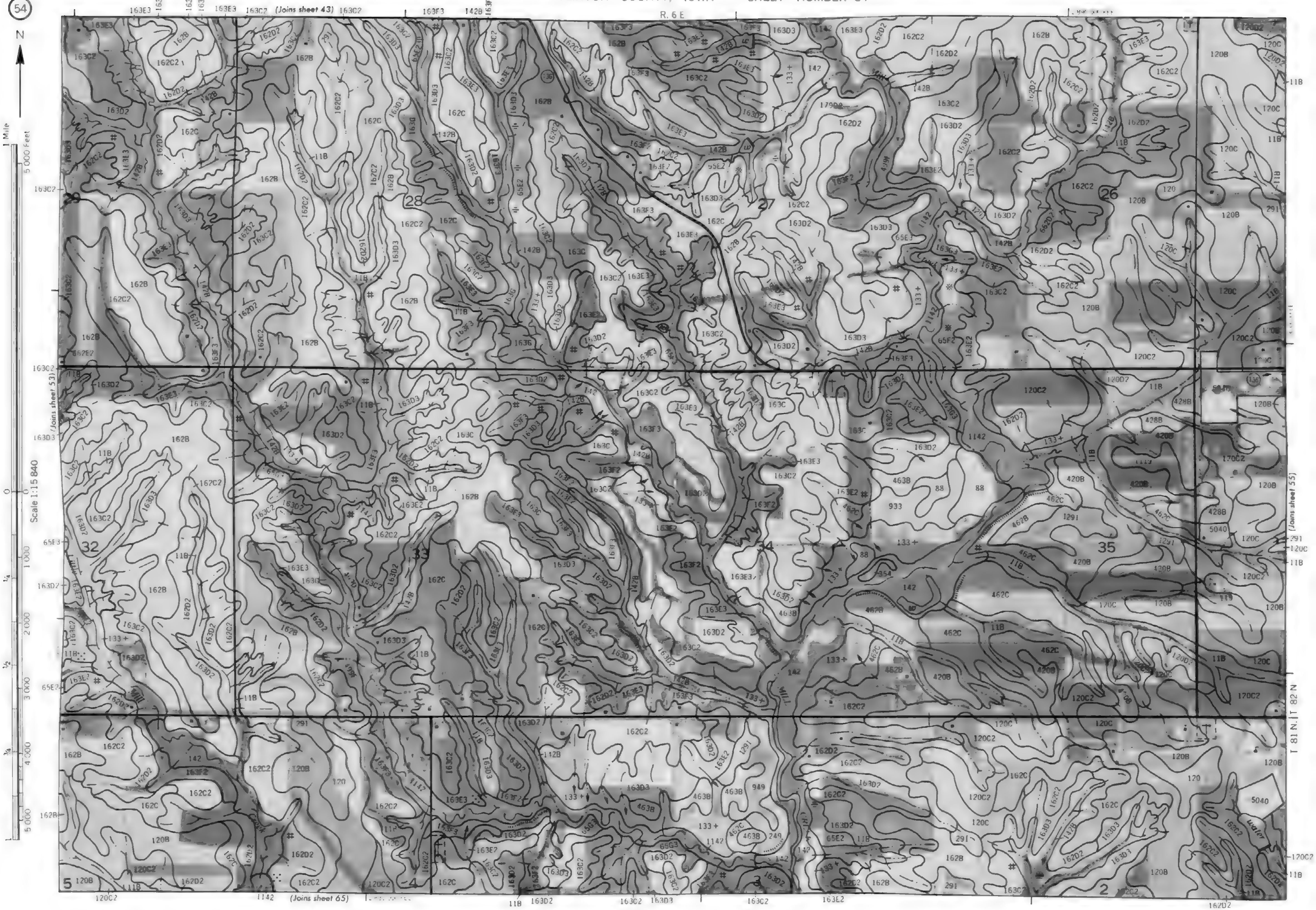

R 3 E
(Joins sheet 38)
(Joins sheet 50)
(Joins sheet 60)
(Joins sheet 49)
T 81 N | T. 82 N.
N
Scale 1:15 840
1 Mile
5 000 Feet
Creek
28
27
26
25
33
34
35
36
4
3
2
1

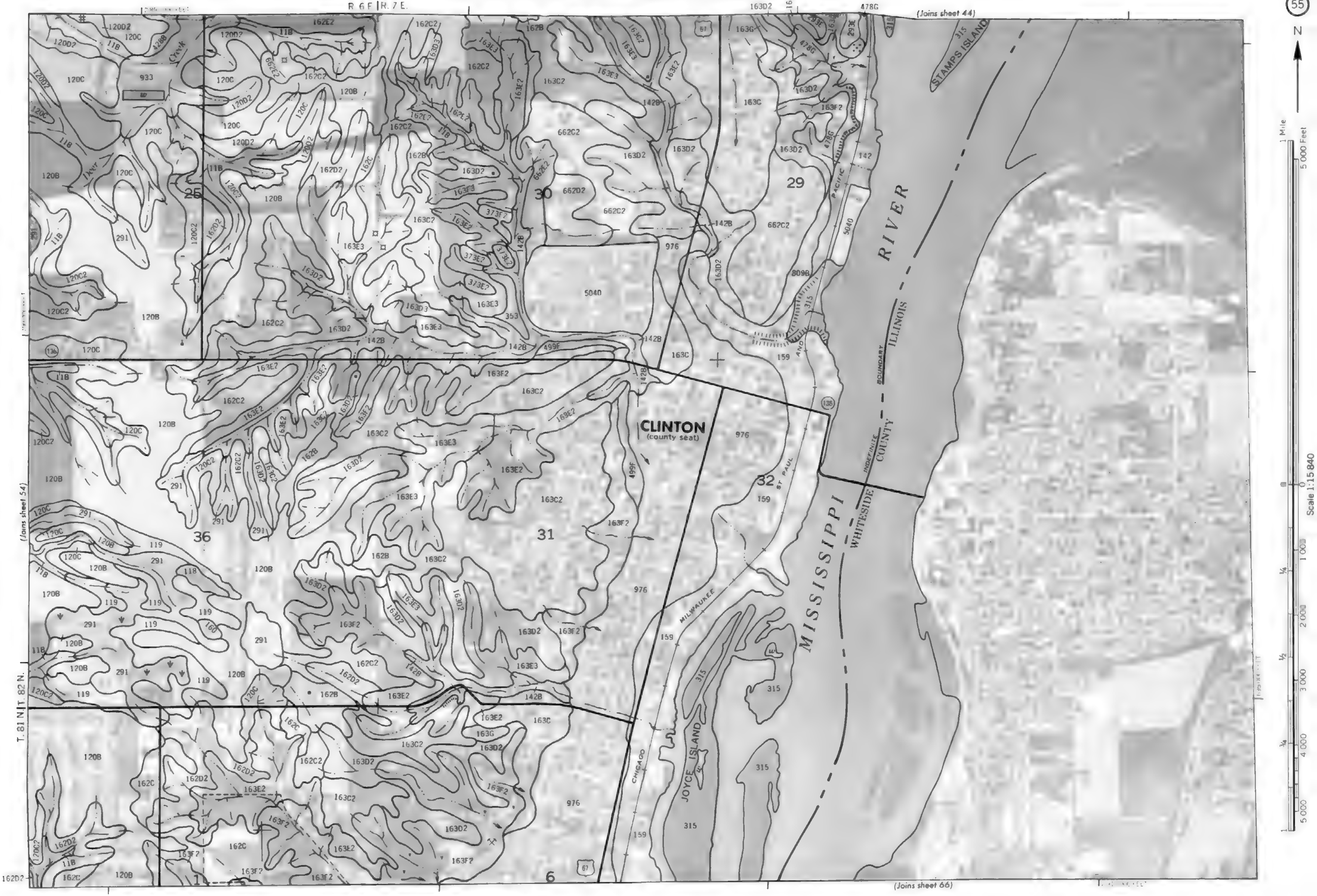

(Joins sheet 39)
(Joins sheet 49)
(Joins sheet 51)
(Joins sheet 61)
R. 3 E. R. 4 E.
T. 81 N. T. 82 N.
N
1 Mile
5 000 Feet
Scale 1:15 840
25
30
29
28
36
31
32
33
1
6
5
4


51
R. 4 E. | R. 5 E.
(Joins sheet 40)
(Joins sheet 50)
(Joins sheet 52)
(Joins sheet 62)
T. 81 N. | T. 82 N.
N
1 Mile
5 000 Feet
Scale 1:15 840
27
26
25
30
34
35
36
31
3
2
6
Cherry

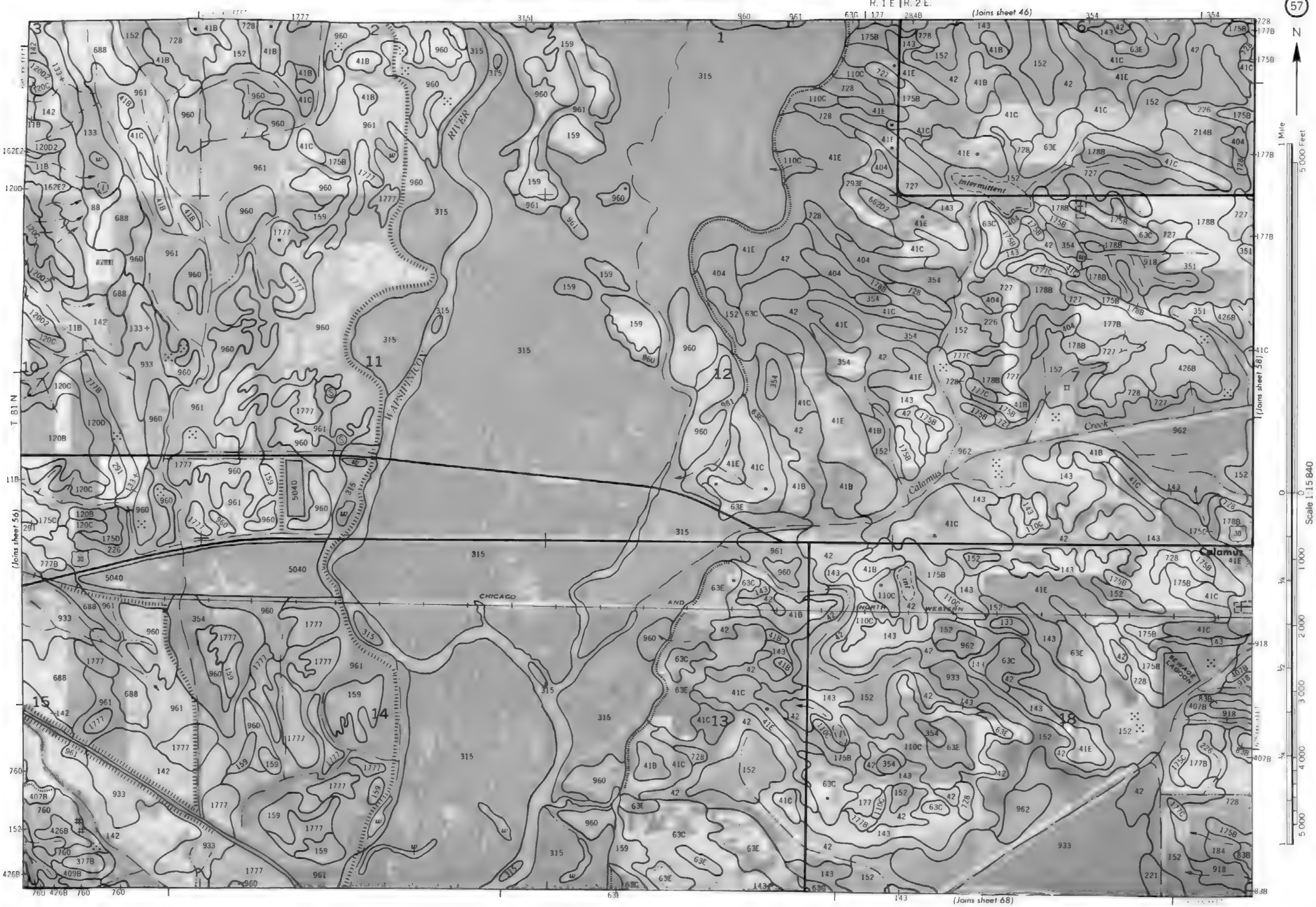

(Joins sheet 41)
R. 5 E.
(Joins sheet 51)
(Joins sheet 53)
(Joins sheet 63)
N
1 Mile
5 000 Feet
Scale 1:15 840
T. 81 N. | T. 82 N.
Brophy Creek
Elvira
27
28
29
30
31
32
33
34
3
4
5
6


(Joins sheet 42)
(Joins sheet 54)
(Joins sheet 64)
(Joins sheet 52)
R. 5 E. | R. 6 E.
T 81 N. | T 82 N.
N
1 Mile
5 000 Feet
Scale 1:15 840
26
25
30
29
35
36
31
32
2
1
6
5

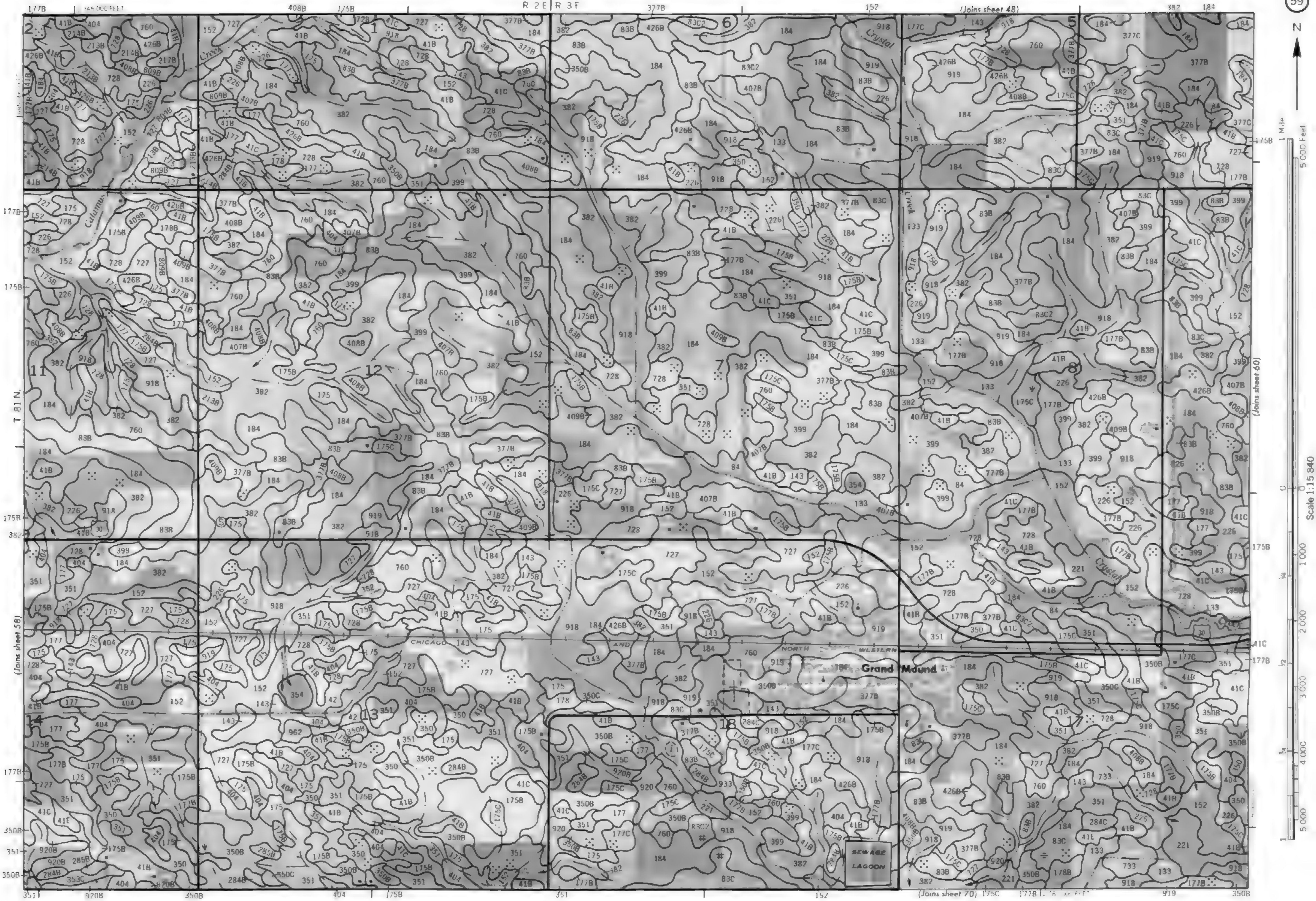

N
(Joins sheet 43)
(Joins sheet 53)
(Joins sheet 55)
(Joins sheet 65)
R. 6 E.
T 81 N. | T 82 N.
Scale 1:15 840
1 Mile
5 000 Feet
28
26
29
32
33
35
5
4
3
2

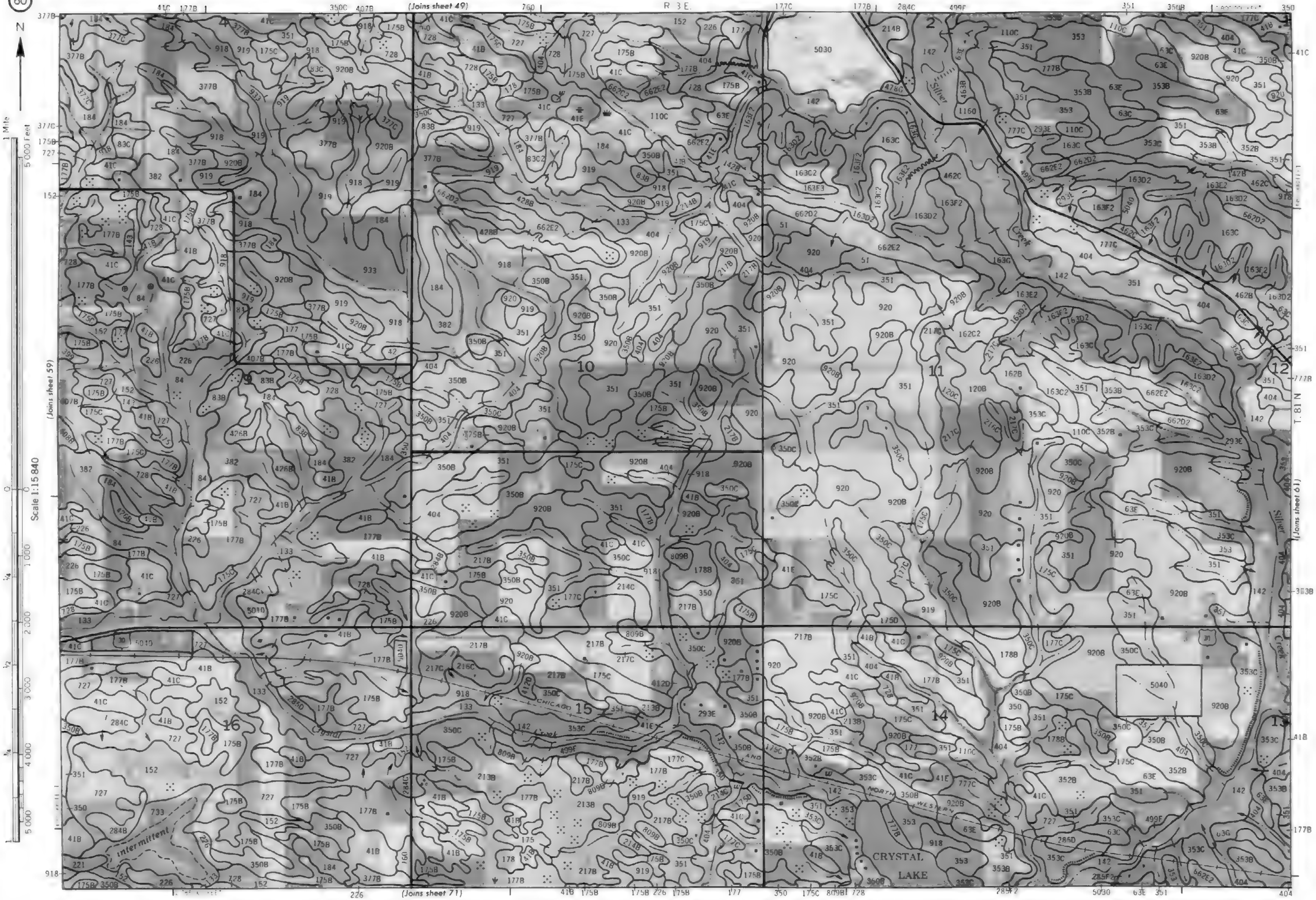

55
N
R. 6 E. | R. 7 E.
T. 81 N. | T. 82 N.
(Joins sheet 44)
(Joins sheet 54)
(Joins sheet 66)
CLINTON
(county seat)
MISSISSIPPI
RIVER
ILLINOIS
WHITESIDE
COUNTY
INDEFINITE
BOUNDARY
STAMPS ISLAND
JOYCE ISLAND
CHICAGO
MILWAUKEE
ST PAUL
AND
PACIFIC
Deer
Creek
25
30
29
36
31
32
6
1
1 Mile
5 000 Feet
Scale 1:15 840

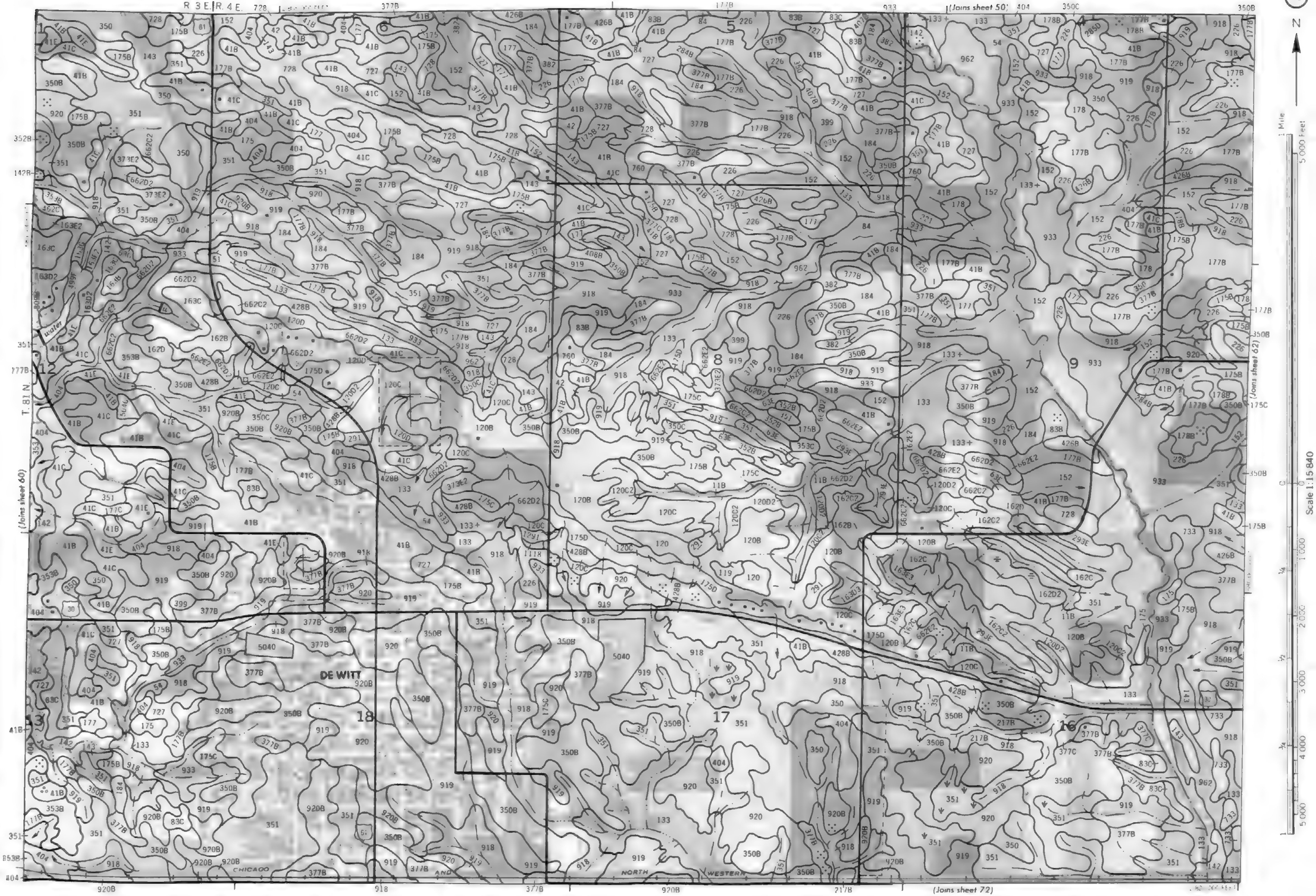
(Joins sheet 45)
(Joins sheet 67)
(Joins sheet 57)
R. 1 E.
T. 81 N.
N
CEDAR COUNTY
Wheatland
YANKEE RUN
CHICAGO AND NORTH WESTERN
Scale 1:15 840
1 Mile
5 000 Feet

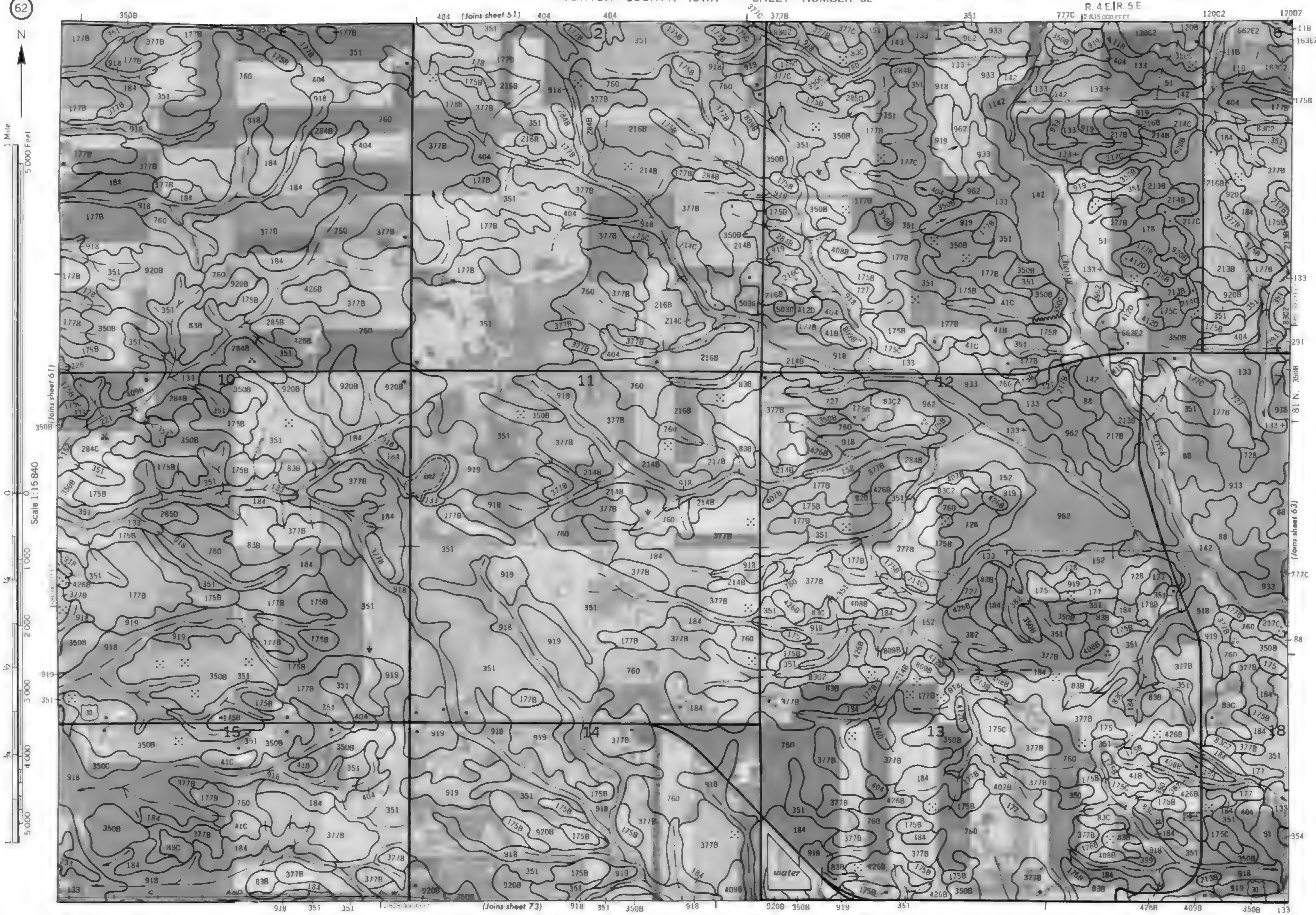

R. 1 E. | R. 2 E.
(Joins sheet 46)
(Joins sheet 56)
(Joins sheet 58)
(Joins sheet 68)
T. 81 N.
57
N
WAPSIPINICON
RIVER
Calamus
Creek
Calamus
CHICAGO
AND
NORTH
WESTERN
Intermittent
SEWAGE LAGOON
1 Mile
5 000 Feet
Scale 1:15 840
0
1 000
2 000
3 000
4 000
5 000
1/4
1/2
3/4

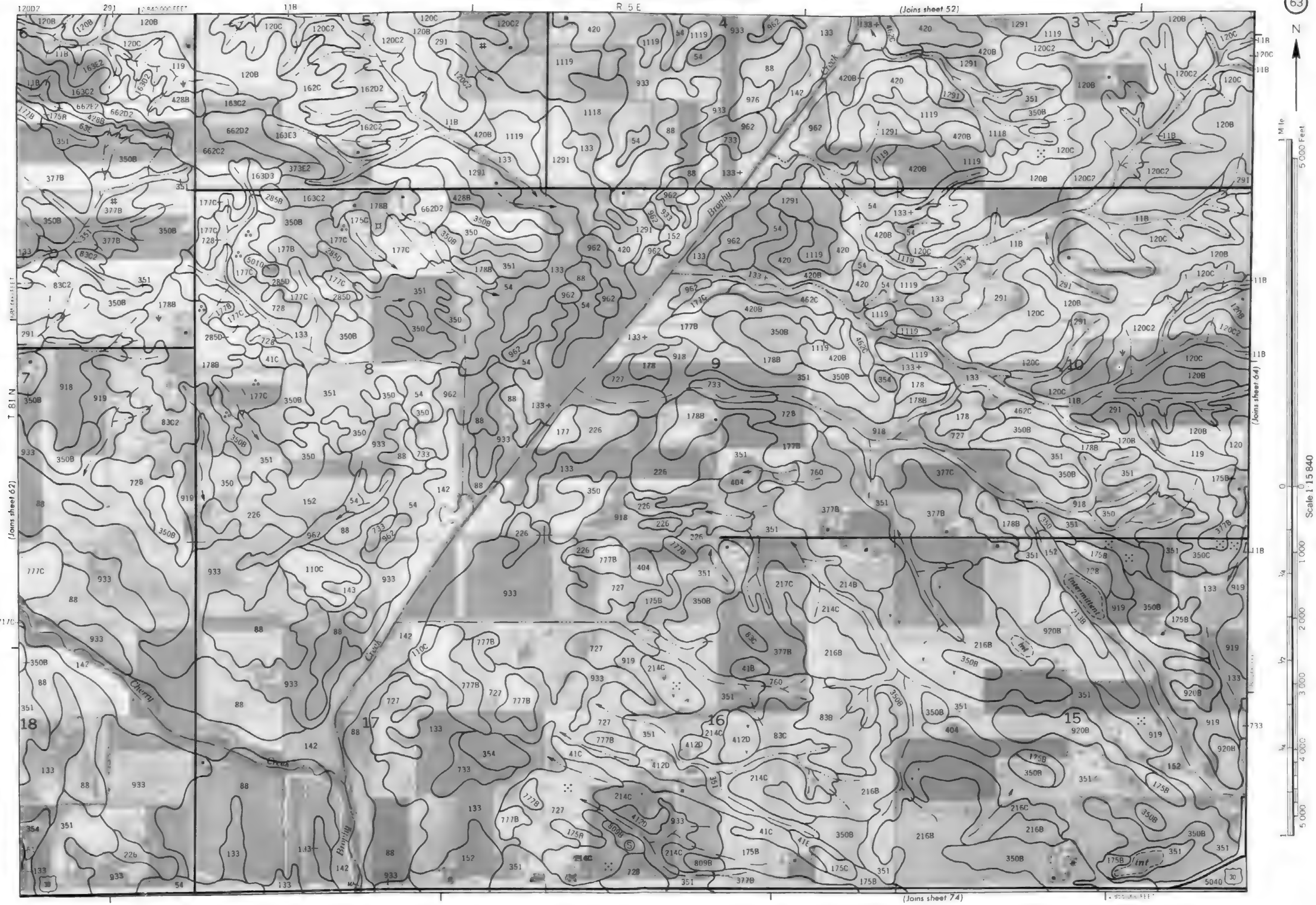

(Joins sheet 47)
R. 2 E.
(Joins sheet 57)
(Joins sheet 59)
(Joins sheet 69)
T. 81 N.
Calamus Creek
Calamus
CHICAGO
N
1 Mile
5 000 Feet
Scale 1:15 840


R 2 E | R 3 E
(Joins sheet 48)
(Joins sheet 60)
(Joins sheet 70)
(Joins sheet 58)
T 81 N.
Crystal
Creek
Calamus
CHICAGO AND NORTH WESTERN
Grand Mound
SEWAGE LAGOON
N
Scale 1:15 840
1 Mile
5 000 Feet

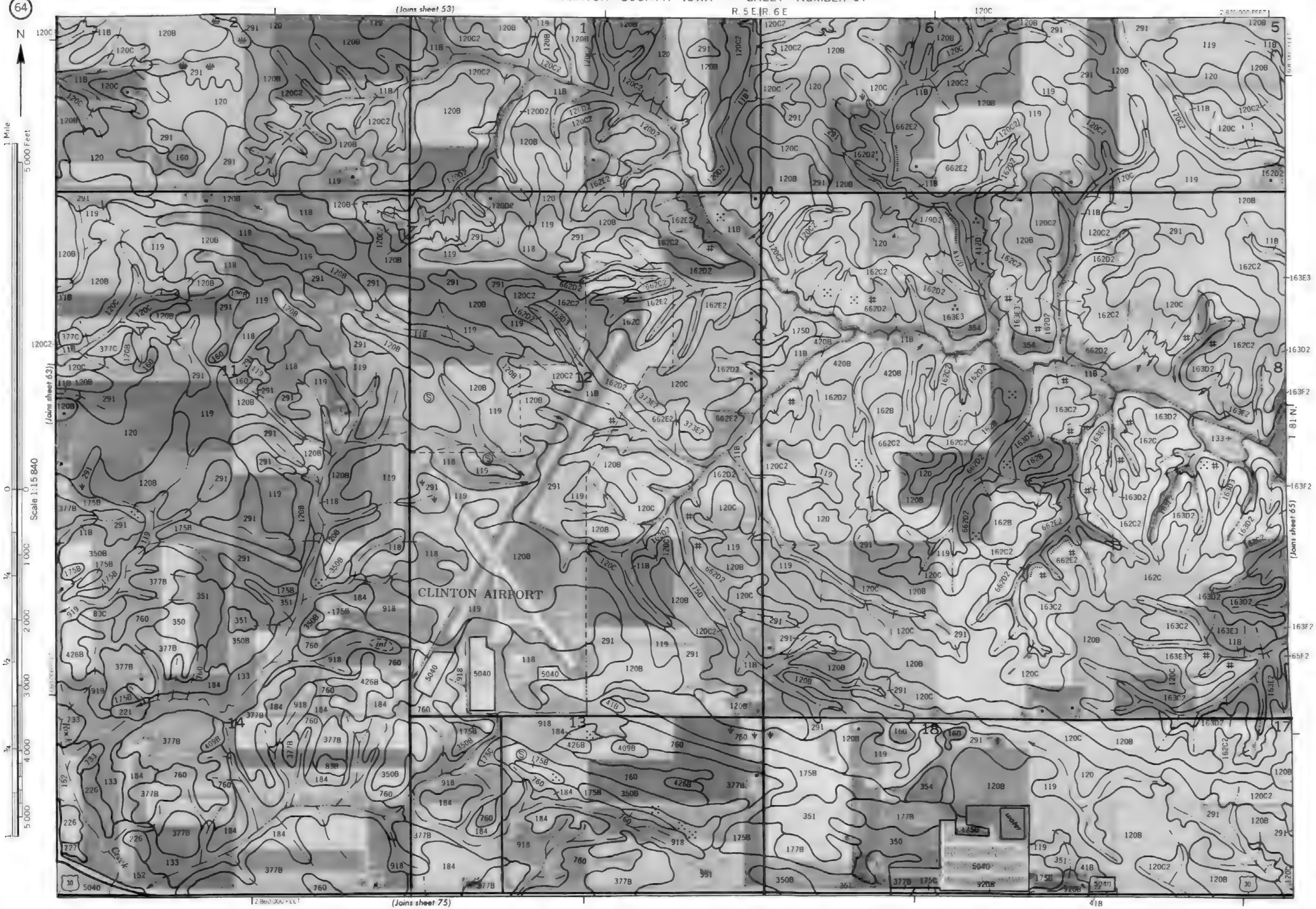

(Joins sheet 49)
R. 3 E.
T. 81 N.
(Joins sheet 59)
(Joins sheet 61)
(Joins sheet 71)
N
1 Mile
5 000 Feet
Scale 1:15 840
CRYSTAL LAKE
Silver Creek
Crystal Creek
CHICAGO AND NORTH WESTERN
Intermittent

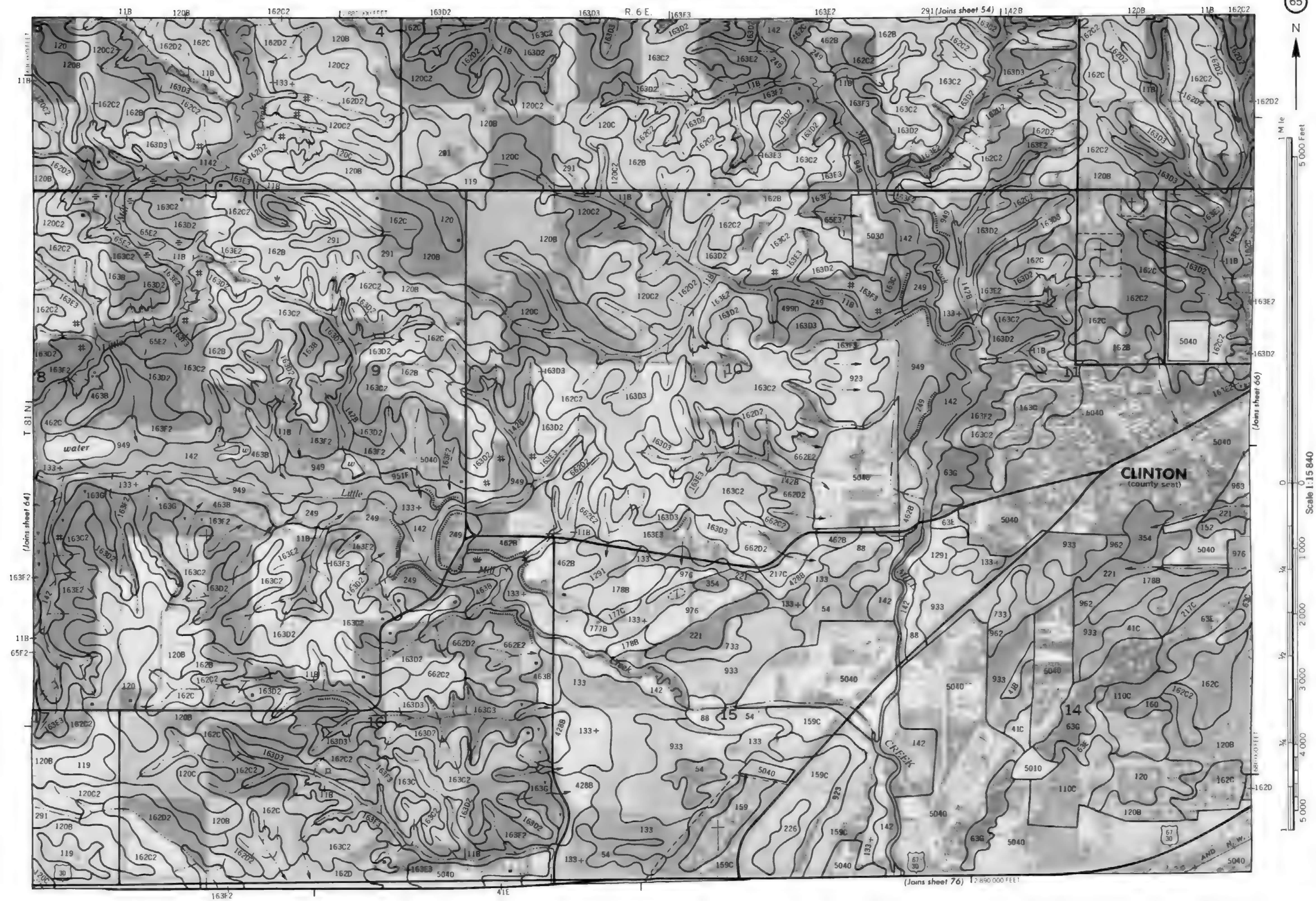

R. 3 E. | R. 4 E.
(Joins sheet 50)
(Joins sheet 60)
(Joins sheet 62)
(Joins sheet 72)
T. 81 N.
DE WITT
CHICAGO AND NORTH WESTERN
N
1 Mile
5 000 Feet
Scale 1:15 840


N
(Joins sheet 51)
(Joins sheet 73)
(Joins sheet 61)
(Joins sheet 63)
R. 4 E. | R. 5 E.
T. 81 N.
Scale 1:15 840
1 Mile
5 000 Feet
water
Cherry
Creek

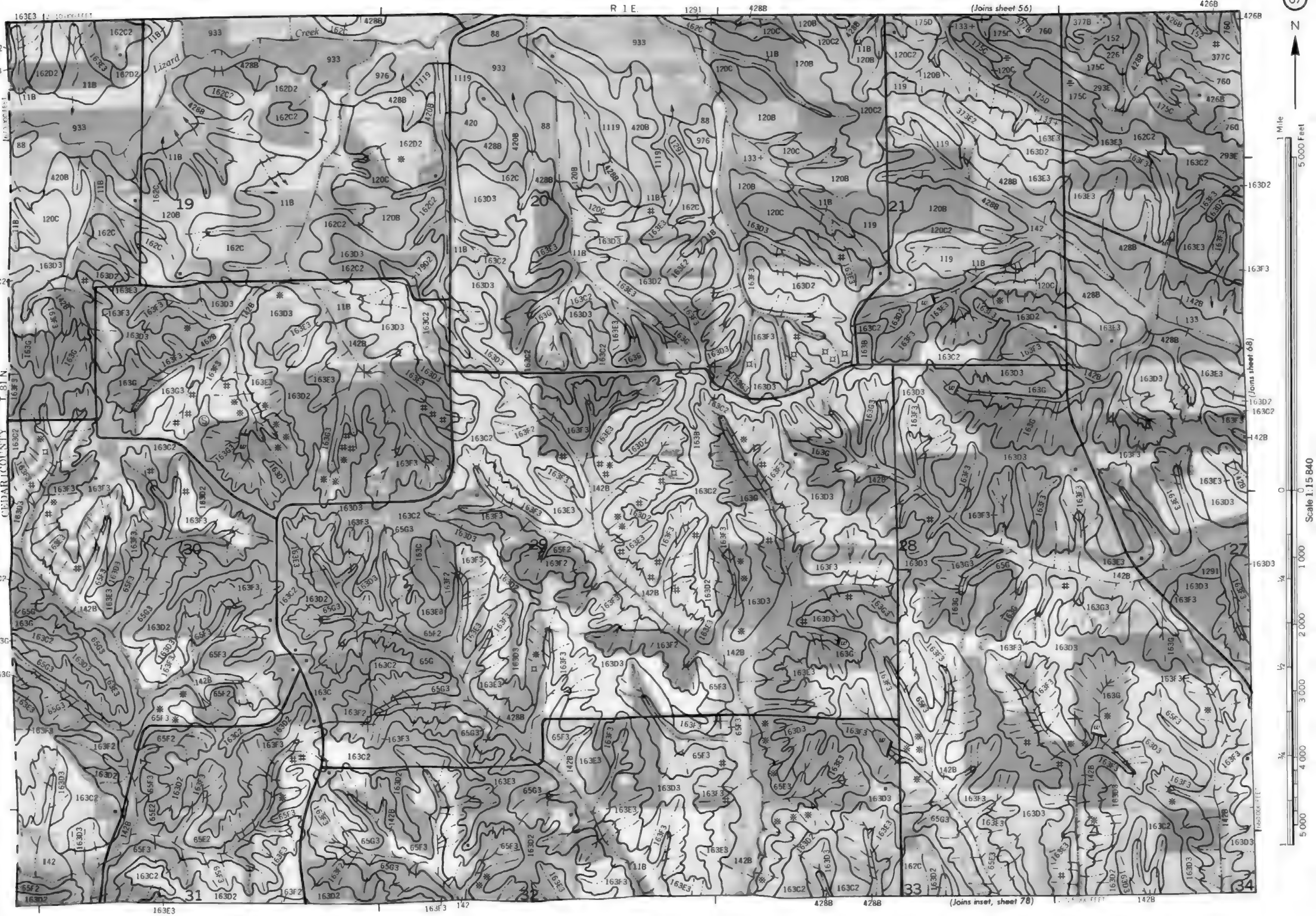

63
R 5 E
T 81 N
(Joins sheet 52)
(Joins sheet 64)
(Joins sheet 74)
(Joins sheet 62)
Brophy Creek
Cherry Creek
Intermittent
N
1 Mile
5 000 Feet
Scale 1:15 840

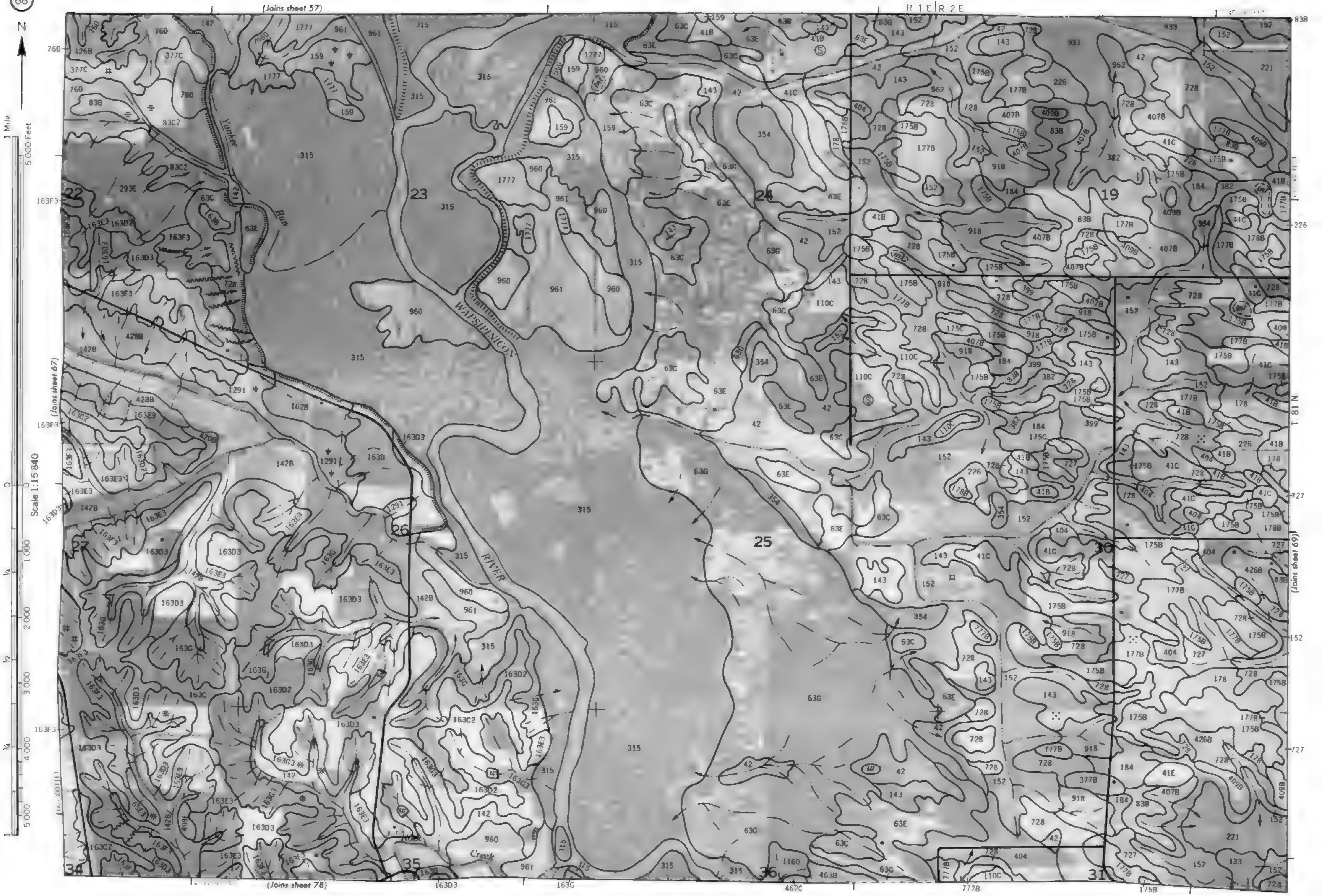
CLINTON COUNTY, IOWA — SHEET NUMBER 64

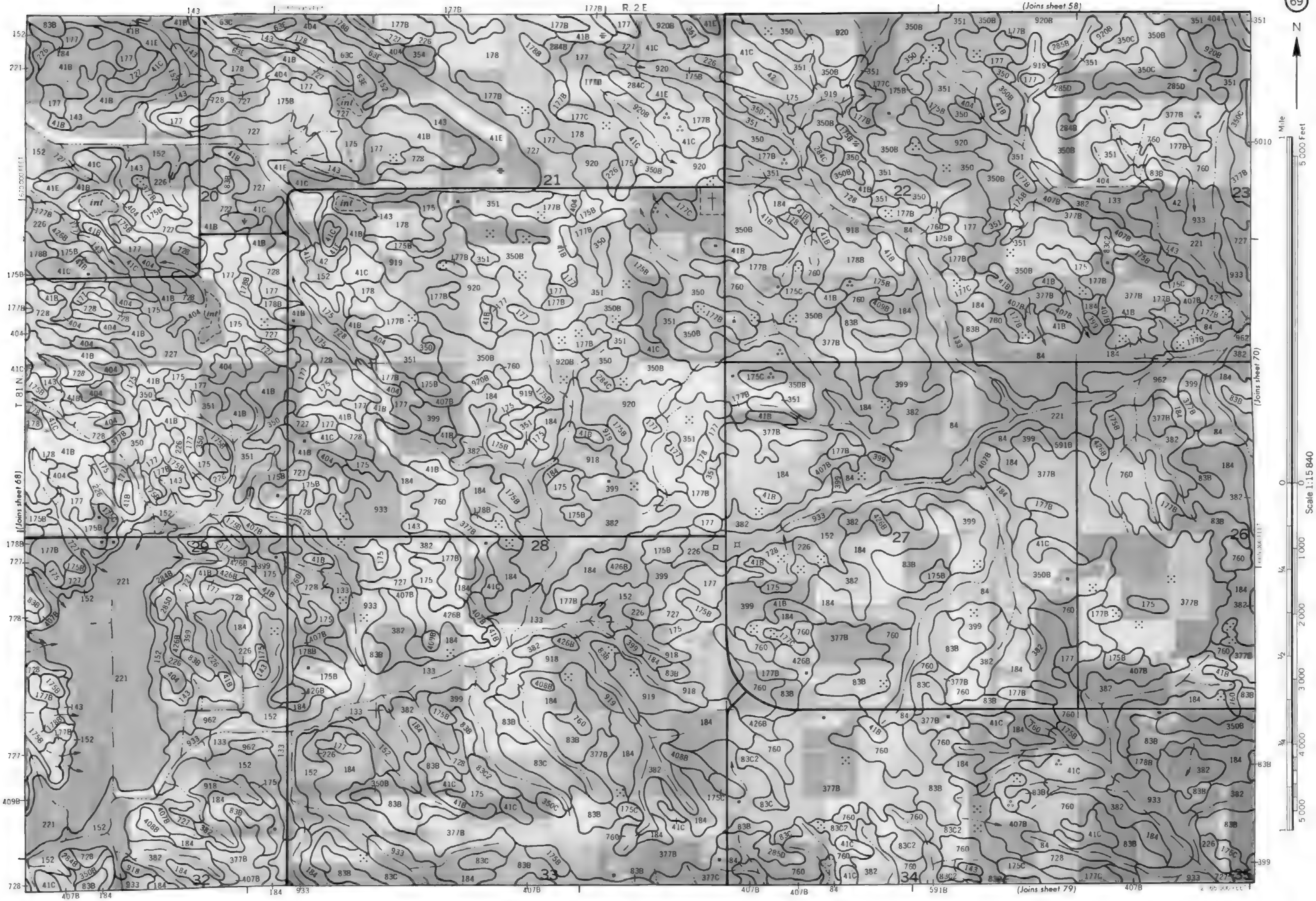



R. 6 E.
T 81 N
N
(Joins sheet 54)
(Joins sheet 64)
(Joins sheet 66)
(Joins sheet 76)
CLINTON
(county seat)
water
Little
Mill
Creek
CREEK
Scale 1:15 840
1 Mile
5 000 Feet

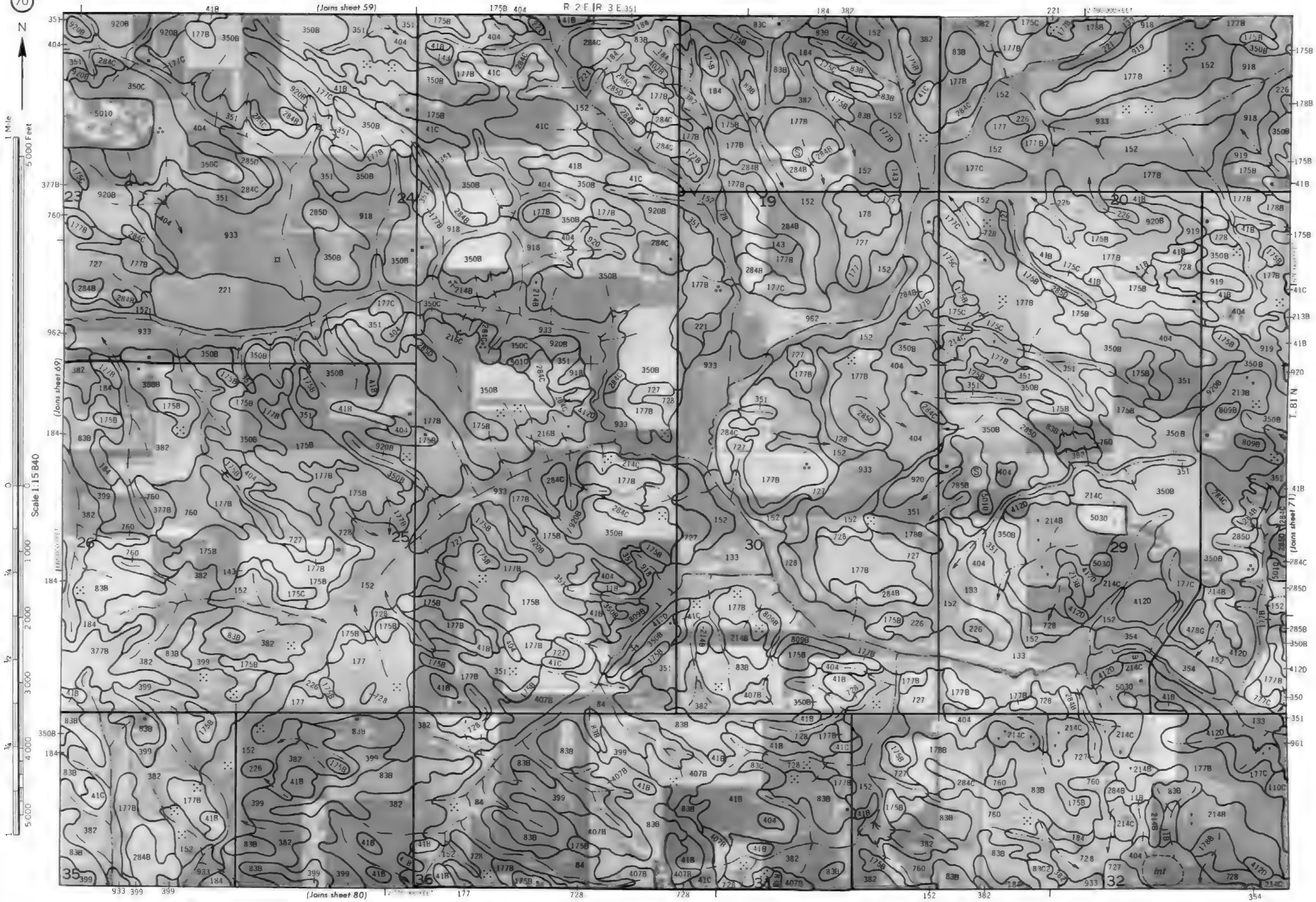

(Joins sheet 55)
R. 6 E. | R. 7 E.
2 910 000 FEET
N
1 Mile
5 000 Feet
Scale 1:15 840
(Joins sheet 65)
T. 81 N.
(Joins sheet 77)
2 895 000 FEET
CLINTON
(county seat)
MISSISSIPPI
RIVER
ILLINOIS
INDEFINITE
BOUNDARY
WHITESIDE
COUNTY
BEAVER
SLOUGH
CHICAGO
AND
NORTH
WESTERN
C AND N W
water
1
6
7
12
13
18
162D2
11B
162C
120B
163F2
976
159
315
163D2
163E3
163C
163E2
5040
175
162D
175B
963
293E
120C
221
63C
960
961


R 1 E.
(Joins sheet 56)
(Joins sheet 68)
(Joins inset, sheet 78)
T. 81 N.
CEDAR COUNTY
Lizard
Creek
19
20
21
27
28
29
30
31
32
33
34
N
1 Mile
5 000 Feet
Scale 1:15 840
0
1 000
2 000
3 000
4 000
5 000
¼
½
¾

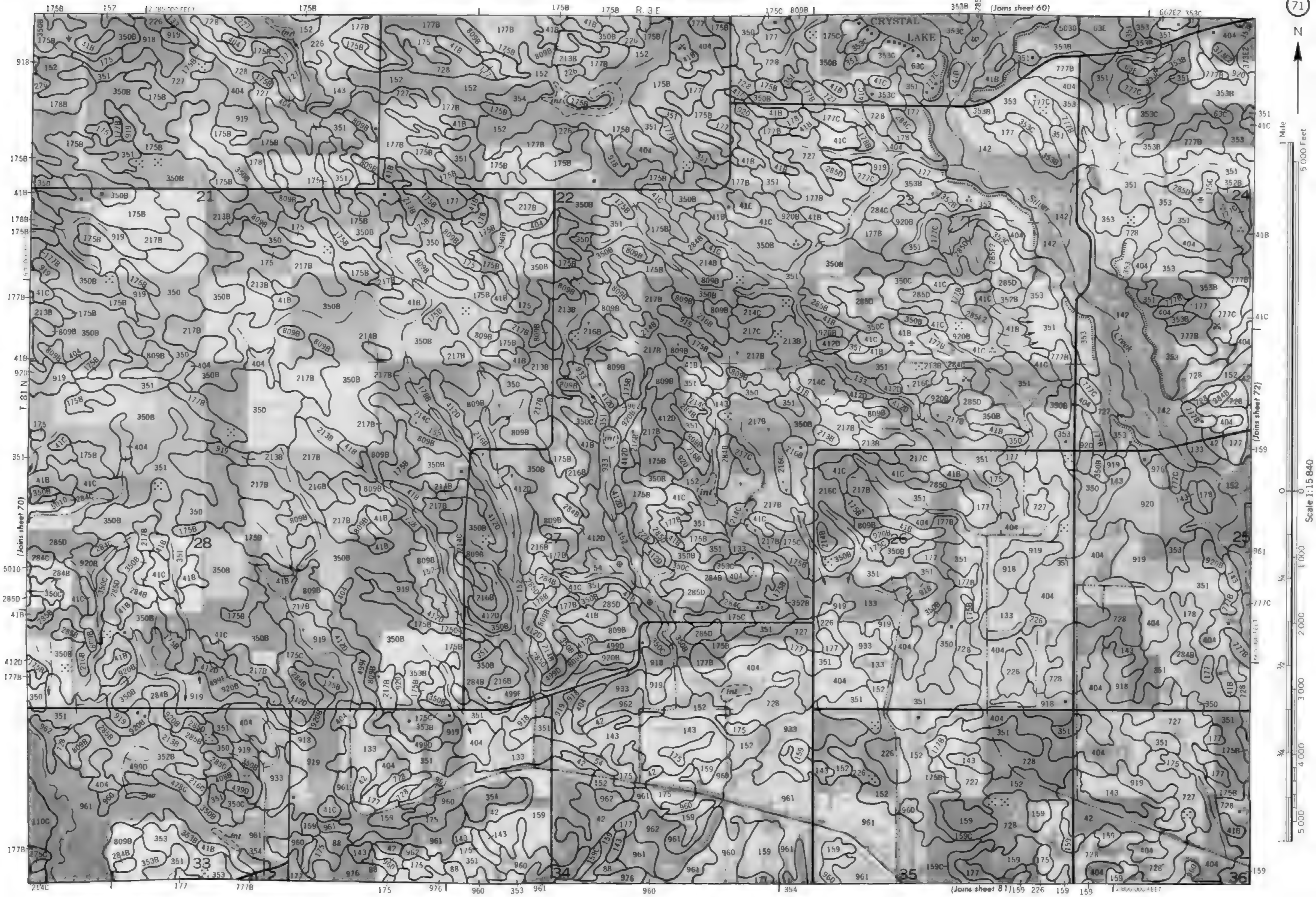

N
(Joins sheet 57)
(Joins sheet 67)
(Joins sheet 69)
(Joins sheet 78)
R 1 E | R 2 E
T. 81 N.
1 Mile
5 000 Feet
Scale 1:15 840
WAPSIPINICON
RIVER
Yankee
Run
Creek
23
24
19
26
25
30
27
34
35
36
31
22

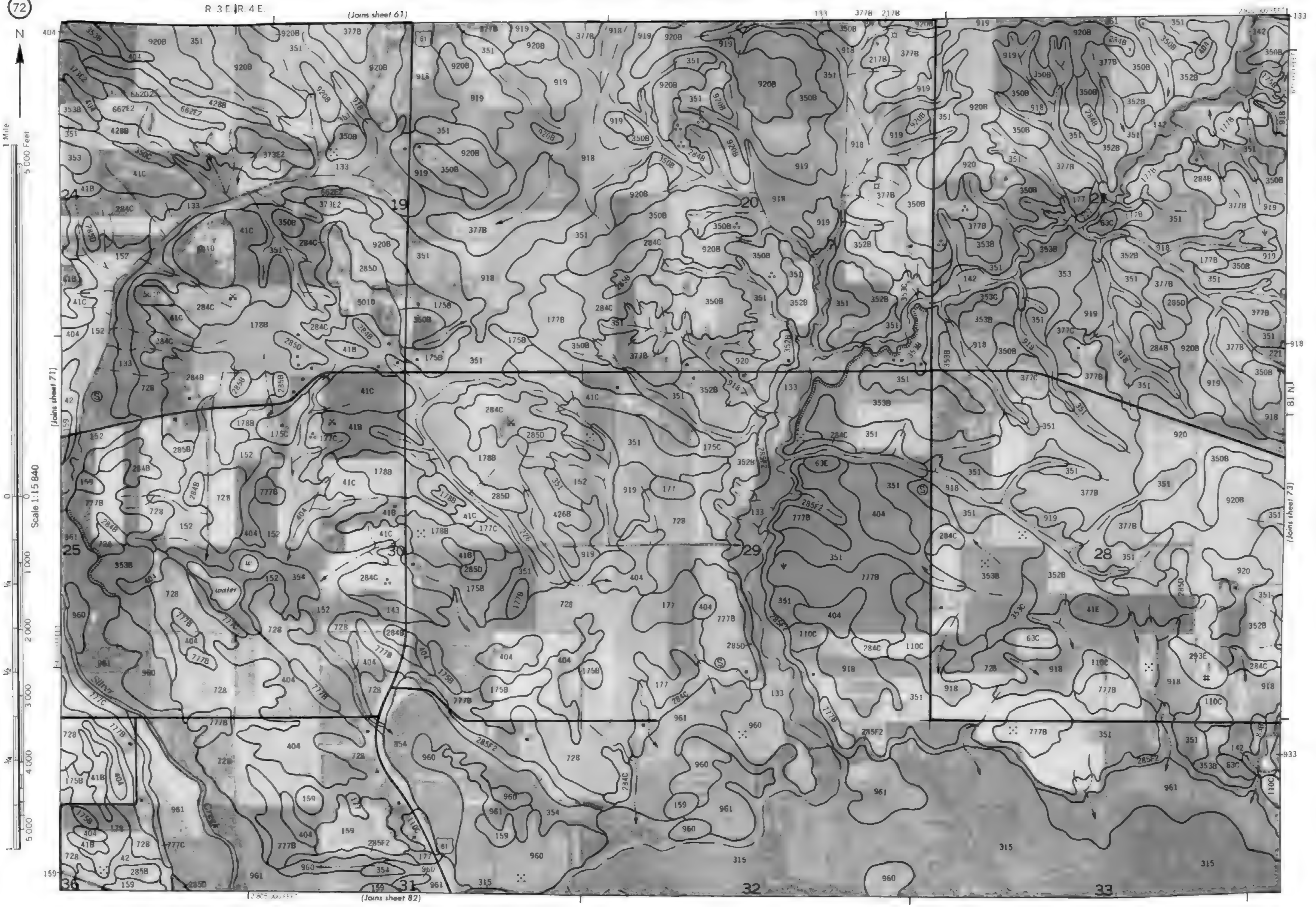

69
N
R. 2 E
T 81 N.
(Joins sheet 58)
(Joins sheet 70)
(Joins sheet 79)
(Joins sheet 68)
Scale 1:15 840
1 Mile
5 000 Feet
20
21
22
23
26
27
28
29
32
33
34
35

CLINTON COUNTY, IOWA — SHEET NUMBER 70

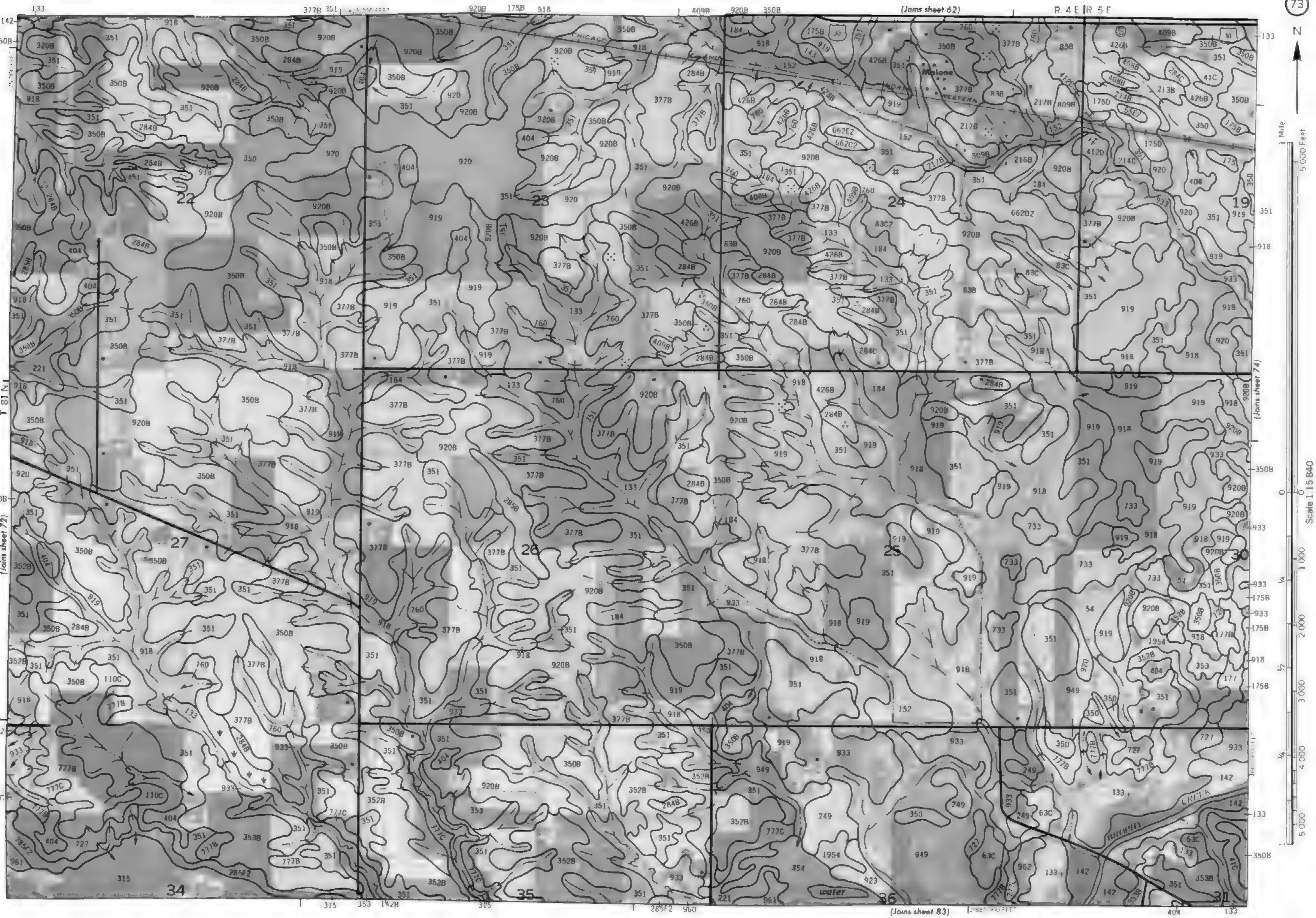


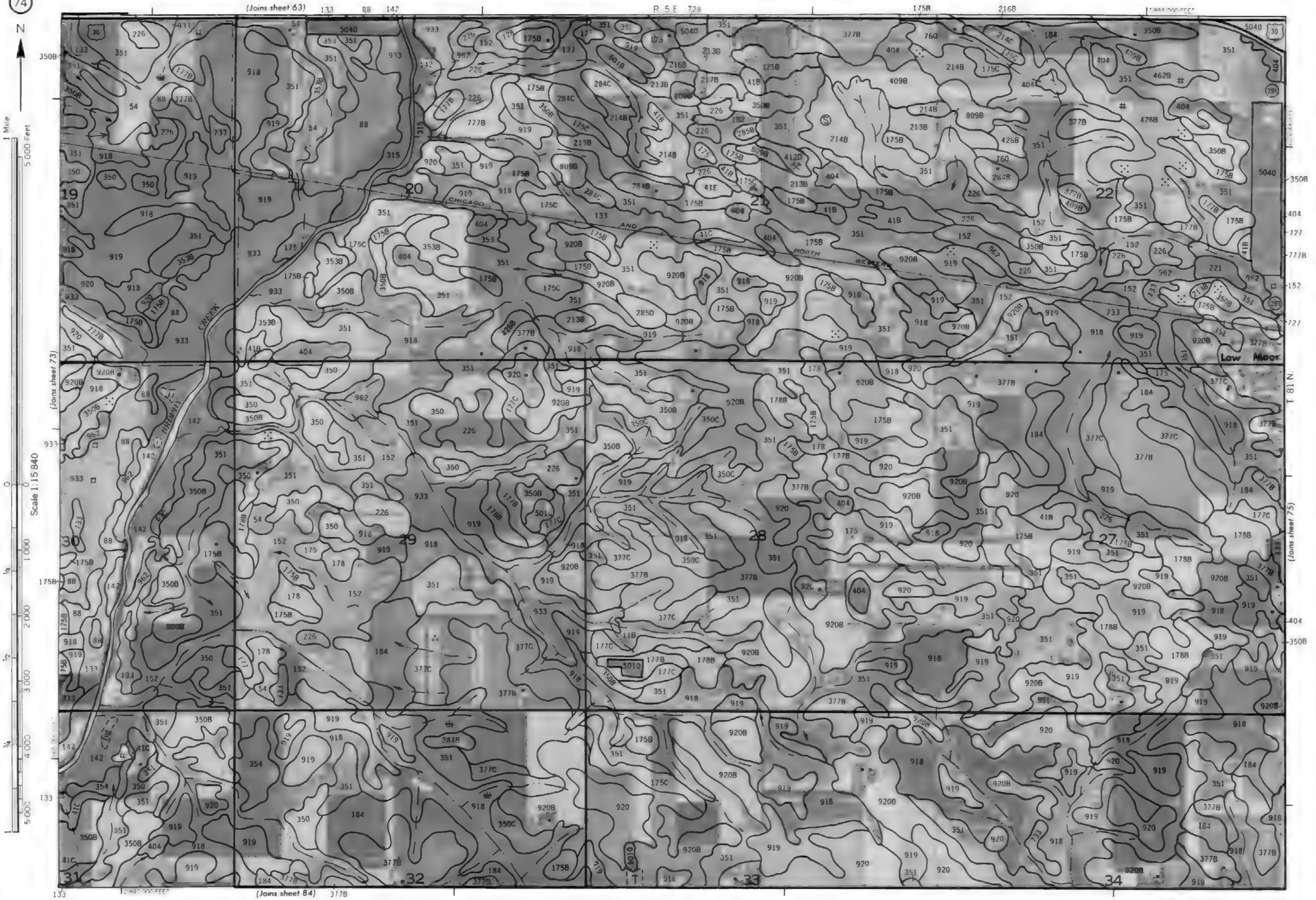
CLINTON COUNTY, IOWA — SHEET NUMBER 71




72
R. 3 E. | R. 4 E.
(Joins sheet 61)
(Joins sheet 71)
(Joins sheet 73)
(Joins sheet 82)
T. 81 N.
N
1 Mile
5 000 Feet
Scale 1:15 840
water
Silver
Creek

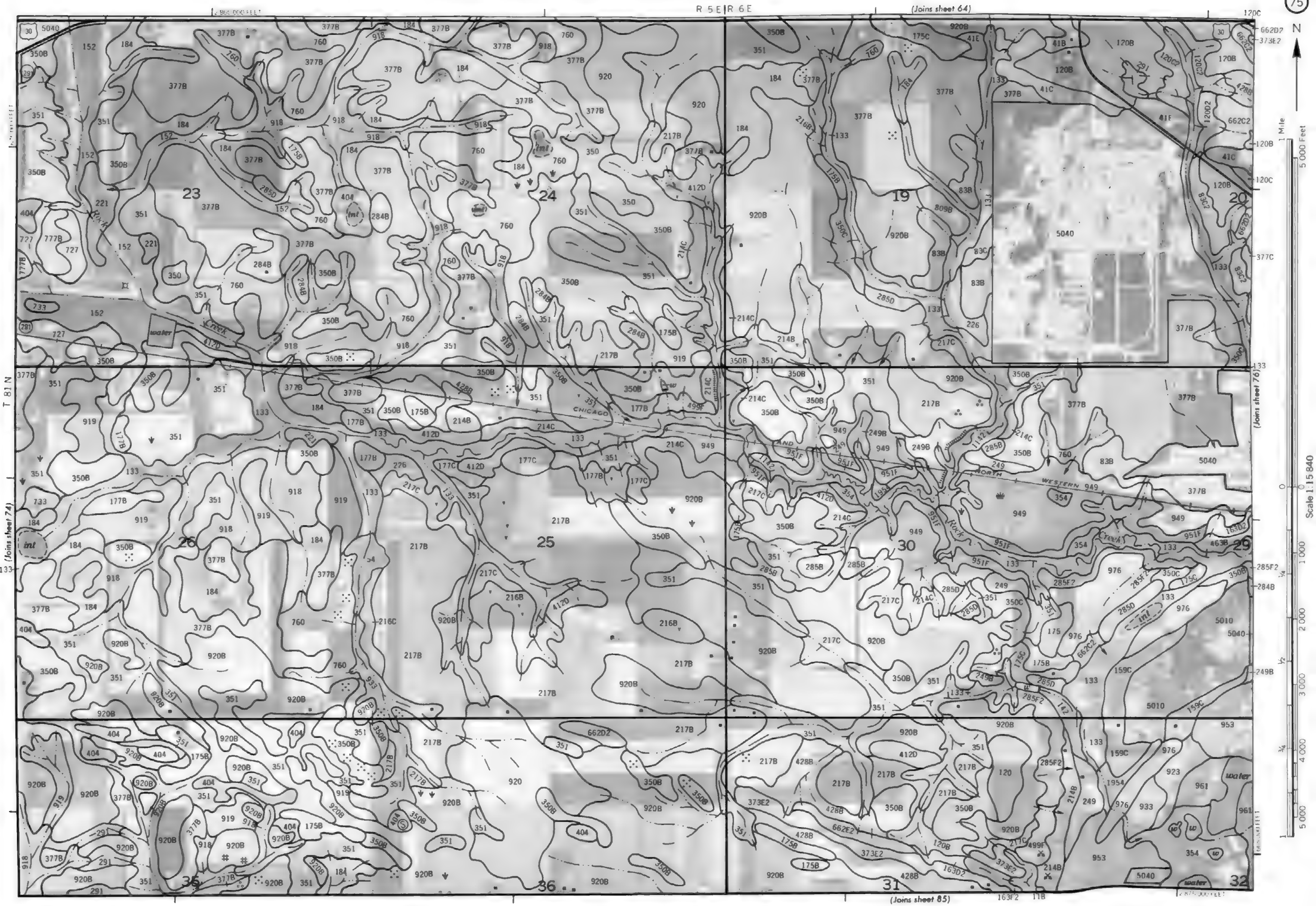
CLINTON COUNTY, IOWA — SHEET NUMBER 73

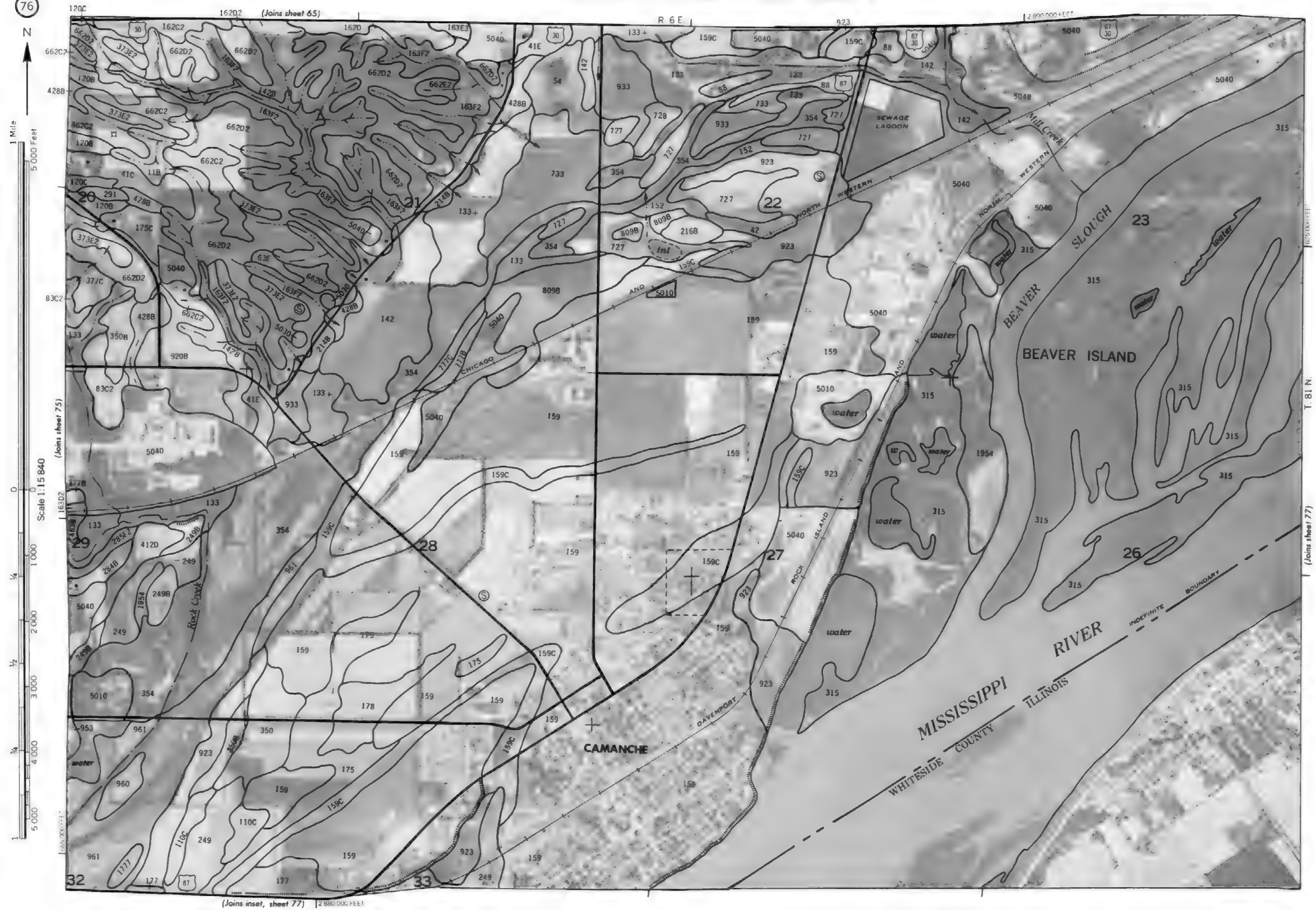


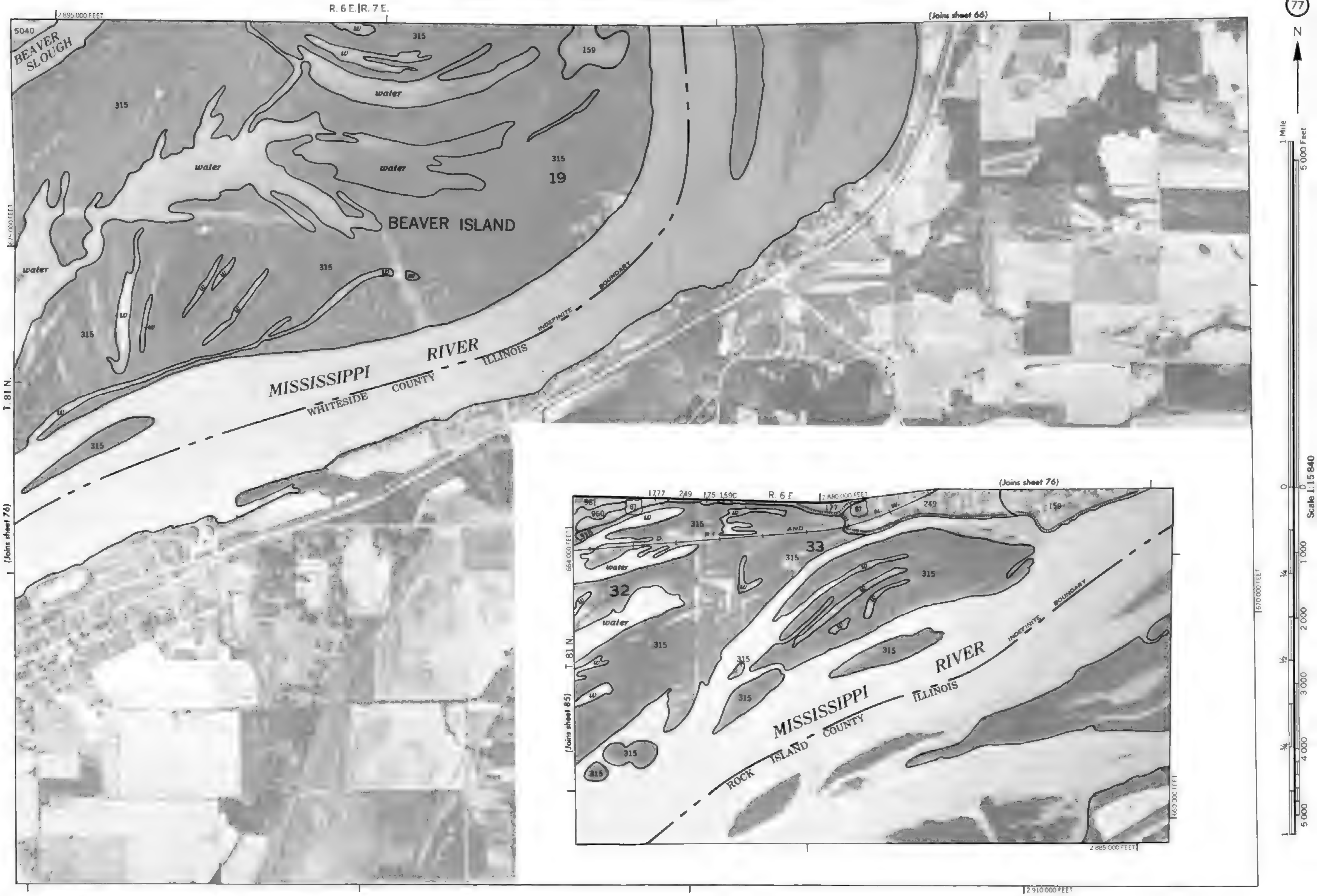

(Joins sheet 63)
R. 5 E.
(Joins sheet 73)
(Joins sheet 75)
(Joins sheet 84)
T. 81 N.
N
1 Mile
5 000 Feet
Scale 1:15 840
CHICAGO AND NORTH WESTERN
CREEK
BROWNS
Low Moor
19
20
21
22
27
28
29
30
31
32
33
34

CLINTON COUNTY, IOWA — SHEET NUMBER 75

75

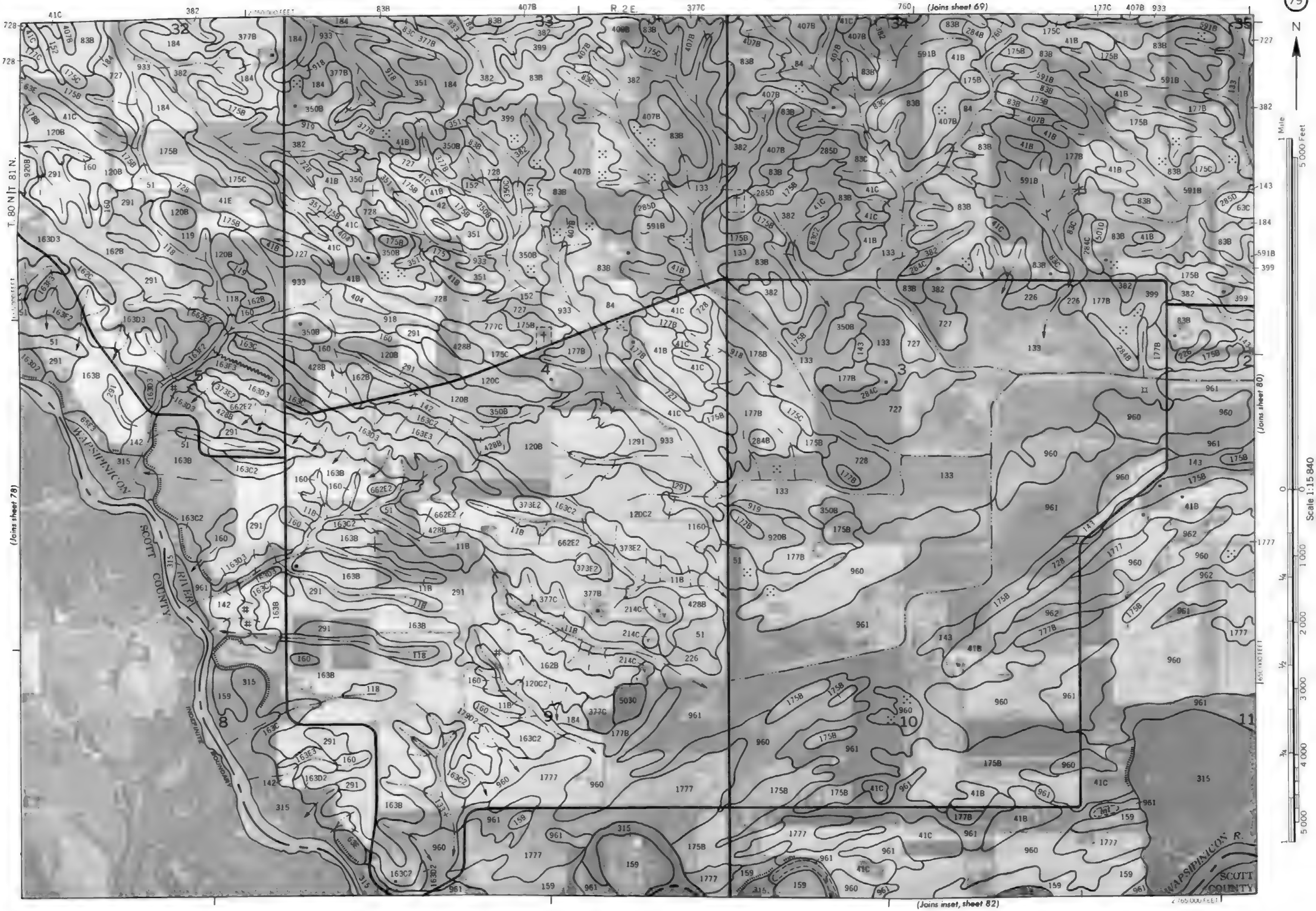



N
(Joins sheet 65)
R 6 E
2 890 000 FEET
SEWAGE LAGOON
Mill Creek
CHICAGO AND NORTH WESTERN
BEAVER SLOUGH
BEAVER ISLAND
T. 81 N.
(Joins sheet 75)
(Joins sheet 77)
Rock Creek
DAVENPORT ROCK ISLAND AND
CAMANCHE
MISSISSIPPI RIVER
WHITESIDE COUNTY ILLINOIS
INDEFINITE BOUNDARY
(Joins inset, sheet 77)
2 880 000 FEET
20
21
22
23
26
27
28
29
32
33
water
Scale 1:15 840
1 Mile
5 000 Feet


77
N
R. 6 E. | R. 7 E.
(Joins sheet 66)
(Joins sheet 76)
(Joins sheet 85)
BEAVER SLOUGH
BEAVER ISLAND
MISSISSIPPI RIVER
WHITESIDE COUNTY ILLINOIS
INDEFINITE BOUNDARY
ROCK ISLAND COUNTY ILLINOIS
T. 81 N.
R. 6 E.
19
32
33
water
315
159
5040
2 895 000 FEET
2 880 000 FEET
2 885 000 FEET
2 910 000 FEET
664 000 FEET
670 000 FEET
660 000 FEET
1 Mile
5 000 Feet
Scale 1:15 840

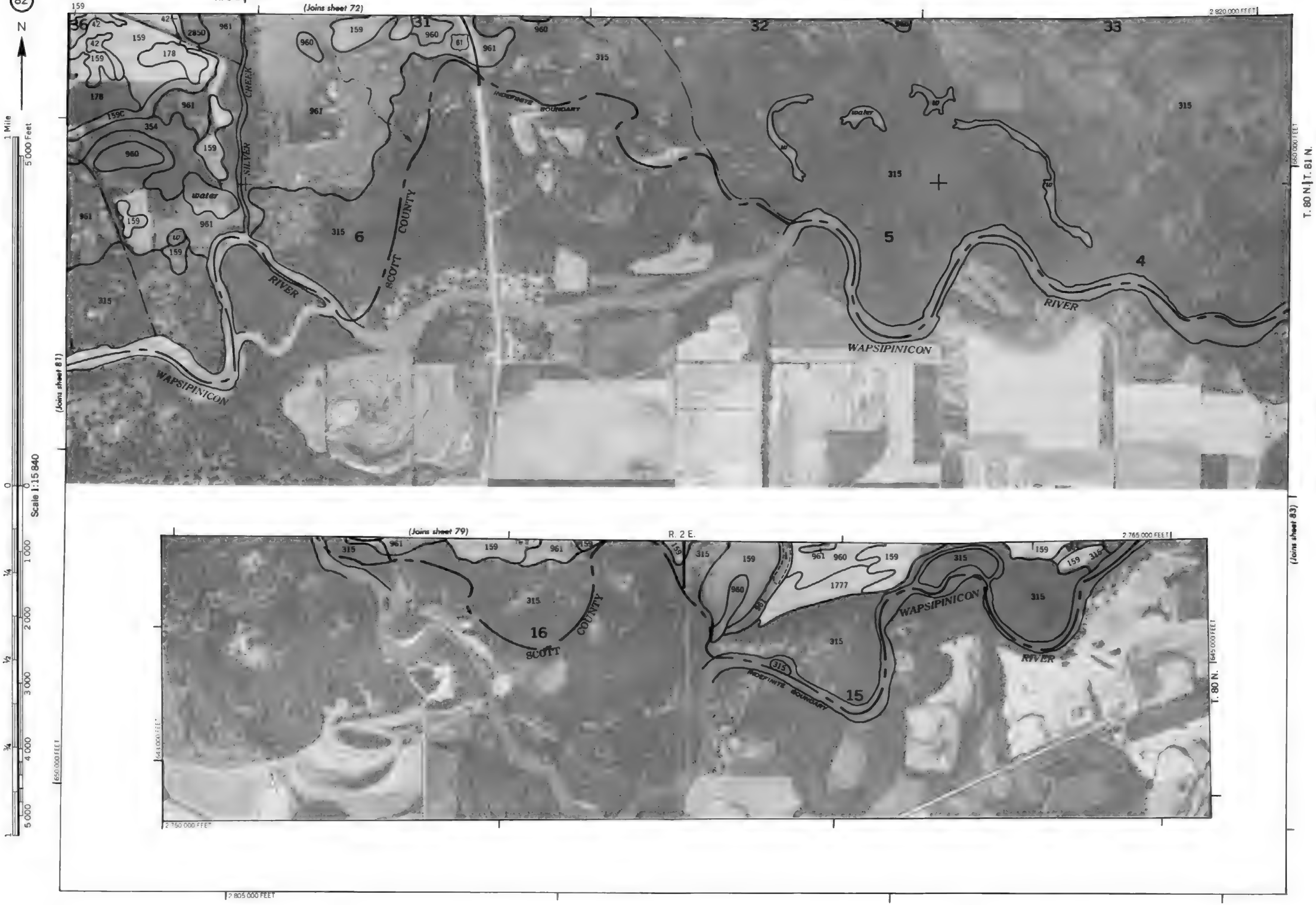

N
1 Mile
5 000 Feet
Scale 1:15 840
(Joins sheet 68)
(Joins inset)
(Joins sheet 79)
R. 1 E.
R. 2 E.
T. 81 N.
T. 80 N.
34
35
36
31
Rock
Creek
WAPSIPINICON
RIVER
SCOTT COUNTY
(Joins sheet 67)
R 1 E
31
32
33
34
CEDAR COUNTY
Rock
Creek
(Joins upper left)
SCOTT COUNTY

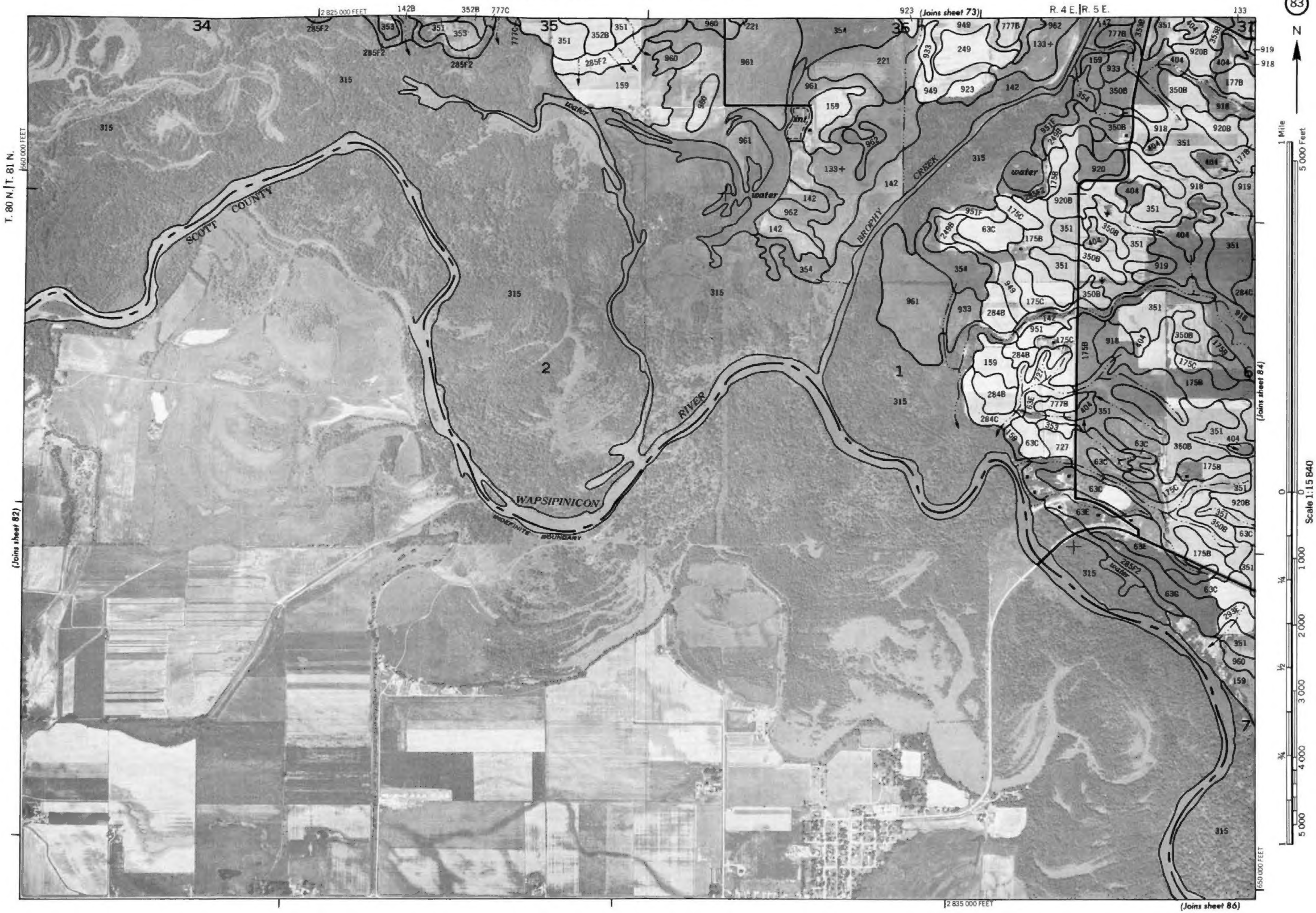
CLINTON COUNTY, IOWA — SHEET NUMBER 79

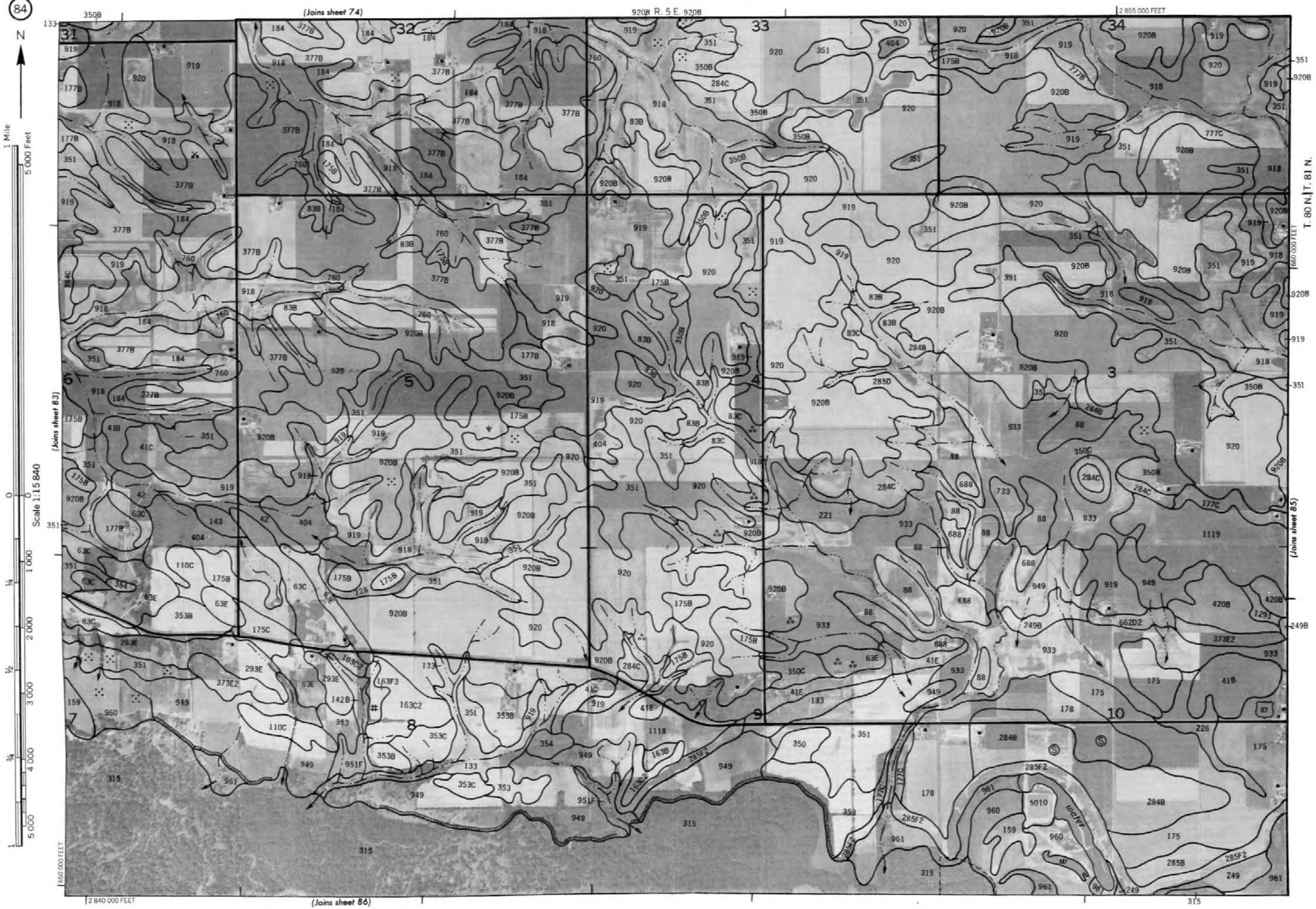



(Joins sheet 70)
(Joins sheet 79)
(Joins sheet 81)
R 2 E | R 3 E
T. 80 N. | T. 81 N.
WAPSIPINICON
RIVER
SCOTT COUNTY
INDEFINITE BOUNDARY
Scale 1:15 840
1 Mile
5 000 Feet
2 770 000 FEET
N

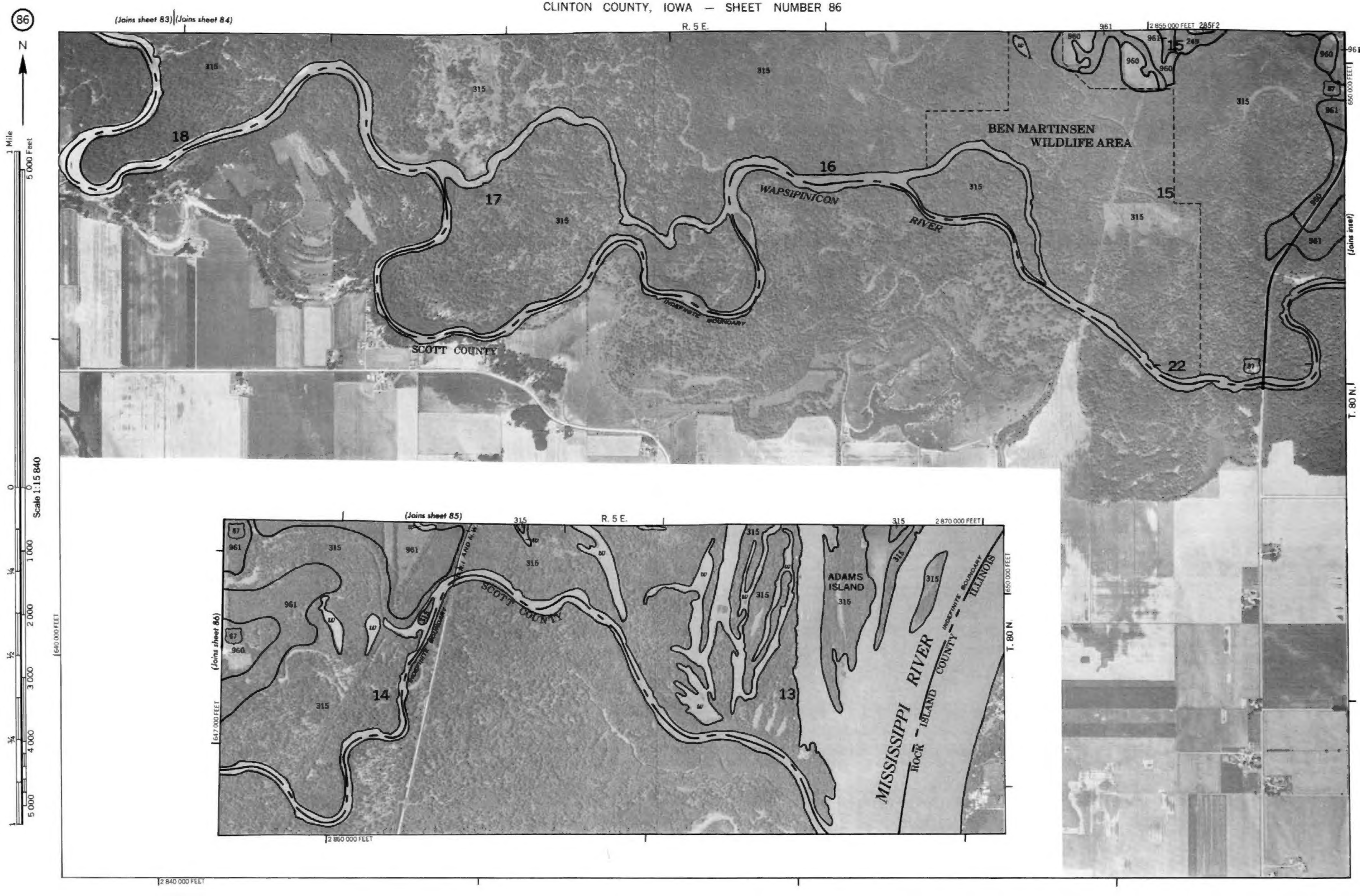

(Joins sheet 71)
R. 3 E.
2 781 500 FEET
T 80 N. | T 81 N.
33
34
35
36
4
3
2
1
WAPSIPINICON
RIVER
SCOTT COUNTY
INDEFINITE BOUNDARY
(Joins sheet 80)
(Joins sheet 82)
2 800 000 FEET
N
1 Mile
5 000 Feet
Scale 1:15 840


N
R. 3 E. | R. 4 E.
(Joins sheet 72)
(Joins sheet 81)
(Joins sheet 79)
(Joins sheet 83)
R. 2 E.
T. 80 N. | T. 81 N.
T. 80 N.
2 820 000 FEET
2 765 000 FEET
2 750 000 FEET
2 805 000 FEET
660 000 FEET
645 000 FEET
650 000 FEET
641 000 FEET
WAPSIPINICON
RIVER
SILVER CREEK
SCOTT COUNTY
INDEFINITE BOUNDARY
water
1 Mile
5 000 Feet
Scale 1:15 840
36
31
32
33
6
5
4
16
15
315
159
961
960
42
178
2850
354
159C
1777


83
N
2 825 000 FEET
(Joins sheet 73)
R. 4 E. | R. 5 E.
T. 80 N. | T. 81 N.
650 000 FEET
34
35
36
31
2
1
6
7
SCOTT COUNTY
WAPSIPINICON
RIVER
BROPHY
CREEK
INDEFINITE BOUNDARY
water
Int.
315
961
142
133+
962
354
221
159
949
923
249
933
960
351
352B
353
285F2
777B
777C
142B
920B
918
919
404
350B
351
920
175B
175C
63C
63E
63G
951F
249B
284B
284C
727
951
933
177B
284C
293E
(Joins sheet 82)
(Joins sheet 84)
(Joins sheet 86)
2 835 000 FEET
1 Mile
5 000 Feet
Scale 1:15 840
0
¼
½
¾
1
1 000
2 000
3 000
4 000
5 000


84
N
(Joins sheet 74)
(Joins sheet 83)
(Joins sheet 85)
(Joins sheet 86)
R. 5 E.
T. 80 N. | T. 81 N.
2 855 000 FEET
2 840 000 FEET
660 000 FEET
650 000 FEET
1 Mile
5 000 Feet
Scale 1:15 840
31
32
33
34
6
5
4
3
7
8
9
10


85
N
(Joins sheet 75)
(Joins sheet 84)
(Joins inset, sheet 77)
(Joins inset, sheet 86)
R. 5 E. | R. 6 E.
T. 80 N. | T. 81 N.
2 860 000 FEET
2 875 000 FEET
660 000 FEET
655 000 FEET
Shaffton
Folletts
SCHRICKLER SLOUGH
MISSISSIPPI RIVER
ADAMS ISLAND
ROCK ISLAND COUNTY
ILLINOIS
INDEFINITE BOUNDARY
DAVENPORT
ROCK ISLAND AND NORTH WESTERN
water
Scale 1:15 840
1 Mile
5 000 Feet



86
N
(Joins sheet 83)
(Joins sheet 84)
R. 5 E.
2 855 000 FEET
650 000 FEET
BEN MARTINSEN
WILDLIFE AREA
WAPSIPINICON
RIVER
INDEFINITE BOUNDARY
SCOTT COUNTY
18
17
16
15
22
315
960
961
(Joins inset)
T. 80 N.
1 Mile
5 000 Feet
Scale 1:15 840
0
1 000
2 000
3 000
4 000
5 000
¼
½
¾
1
(Joins sheet 85)
2 870 000 FEET
2 860 000 FEET
640 000 FEET
647 000 FEET
(Joins sheet 86)
ADAMS
ISLAND
MISSISSIPPI
RIVER
ROCK ISLAND COUNTY
ILLINOIS
14
13
w
2 840 000 FEET